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THE PHILIPPINE JOURNAL OF SCIENCE

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MOSSES OF THE PHILIPPINES

By EDWIN B. BARTRAM

Of Bushkill, Pike County, Pennsylvania

TWENTY-NINE PLATES

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INTRODUCTION

SCOPE AND ACKNOWLEDGMENTS

This volume represents an effort to bring together in a concise orderly manner detailed information regarding the Philippine moss flora. The specific descriptions have in most cases been made from local specimens, and the type material was used for this purpose whenever it was available. In the drawings the author has endeavored to bring out the distinctive features of the respective species.

The physical and floristic features of the Philippine Archipelago have been thoroughly covered by Dr. E. D. Merrill.(11, pp. 7-154) The affinities of the Philippine moss flora are primarily Malayan, as outlined by Dr. C. B. Robinson.(15, pp. 199-218) A marked Himalayan element appears in the mountains of northern Luzon, and the percentage of endemic species is high.

Prior to 1900 the mosses described from the Philippines were relatively few, representing random collections by Meyen, Cuming, Llanos, Wallis, Micholitz, and Warburg. Rapid progress was made under the American régime after 1902. Representative collections of mosses were brought together by Doctor Merrill and his associates in the Bureau of Science and the Bureau of Forestry. These, along with the collections made by Mr. A. D. E. Elmer, were studied and published by Dr. V. F. Brotherus in a series of papers which give the first comprehensive idea of the scope and richness of the Philippine moss flora. Mr. R. S. Williams made extensive collections in Luzon and Mindanao between 1903 and 1905. The details of this important series were published in 1914. Meanwhile constant additions to the bryological herbarium were being made by Messrs. Merrill, Robinson, Whitford, Foxworthy, Copeland, Mearns, McGregor, Ramos, and Edaño, through the Bureau of Science, and by Messrs. Curran, Merritt, and Zschokke through the Bureau of Forestry. In 1926 the sixth and last of the series of papers under the title "Contributions to the Bryological Flora of the Philippines" was published by Brotherus. Some of the subsequent collections were determined by Mr. H. N. Dixon, who has very graciously placed at my disposal his notes and comments on the new and noteworthy species appearing in this series.

At the suggestion of Doctor Merrill, and with the generous coöperation of Dr. Eduardo Quisumbing, Curator of the Philippine National Herbarium, arrangements were made to borrow the moss herbarium of the Bureau of Science. This extensive and invaluable collection, including practically all the new species described by Brotherus and Williams, represents the foundation of our knowledge of the Philippine mosses, and is essential to a clear understanding of the elements involved.

During his residence of about a year in the Philippines, Prof. H. H. Bartlett, of the University of Michigan, not only devoted much of his own time to collecting mosses but also inspired his associates in the University of the Philippines to do likewise. As a result of Professor Bartlett's individual work throughout the Archipelago, coupled with the activities of Dr. Maria D. Pastrana, Mr. Jose V. Santos, and Mr. Liborio Ebalo in Luzon, the list of Philippine species has been expanded to a surprising extent.

Through the courtesy of Prof. Rafael B. Espino the moss herbarium of the College of Agriculture, especially rich in collections from Mount Maquiling and Mount Banahao, has been made available, and I am under obligation to Mr. James W. Chapman for a series of Negros mosses that adds considerably to our meagre knowledge of the mosses of this island.

The process of organizing these various collections has involved much critical and editorial labor. The final analysis shows a total of 512 species, representing 180 genera, known at present from the entire Archipelago. That this total is far from being a complete representation of the flora, is evidenced by the continued appearance of new records and new species in practically every sizable collection that comes in for determination. The self-sacrificing labors of numerous collections under arduous conditions have been immensely productive over the past 35 years, but it is logical to expect that further field work will continue to expand the moss flora to an appreciable extent. While I am acutely sensible of the deficiencies of the present work in many particulars, the descriptions, keys, and drawings it contains may serve in some way as a basis upon which to build a more comprehensive taxonomic study of the Philippine moss flora in the years to come.

With some minor changes the sequence of families and genera is essentially the same as that used by Brotherus in the second edition of the "Pflanzenfamilien." The nomenclature follows the current international ruling, starting from Hedwig's Species Muscorum, 1801.

I can do no more than gratefully acknowledge my deep obligation to Doctor Quisumbing for the loan of the moss herbarium of the Bureau of Science, without which the present work would manifestly have been impossible. No light responsibility is assumed in risking such a valuable collection to the hazards of a voyage halfway round the world and back. The editorial coöperation of Doctor Quisumbing has also been one of the prime factors essential to the publication of the work in its present form. The types of Müller's species needed for critical comparison have been made available through the kindness of Dr. H. Reimers, of the Botanical Garden in Berlin-Dahlem, and specimens of some of the species cited in the Philippine papers which do not appear in the Bureau of Science herbarium were provided by Dr. Harald Lindberg from the Brotherus collection in the Botaniska Museum at Helsingfors.

Comparative studies have suggested a number of reductions to synonymy in the interest of practical specific segregation. The responsibility for these changes rests entirely upon my own shoulders. Errors of judgment and commission are undoubtedly present, so that corrections and suggestions will be heartily welcomed.

LIFE HISTORY AND STRUCTURAL FEATURES OF MOSSES

A brief outline of the life history and structure of mosses should not be without value in a work designed to assist the student in identifying and classifying the mosses of a limited area.

The minute unicellular spore, under favorable conditions, germinates and develops as a slender filament which in most mosses elongates and branches to form a thin chlorophyllose felt or mat, termed the protonema. The protonema produces buds and usually disappears, although in some species it may persist for a considerable time. The buds develop into moss plants.

The moss plant consists of a stem and leaves, but has no true roots. The stem may be either simple or branched, and is usually provided with radicles which attach themselves to the substratum and function as roots. The leaves vary widely, although all are sessile and none are compound; a few are lobed, many are toothed, and some are laciniate. The simple leaf structure, except for the costa, usually consists of a single layer of cells. The leaf cells are often differentiated at the margins and at the basal angles and are either smooth or papillose. The shape of these cells is an important diagnostic character.

Reproduction may be sexual, or it may be accomplished by means of specialized bodies termed propagula or gemmæ. The sexual organs are of two kinds, the antheridia or male organs, and the archegonia or female organs. The relative positions of the antheridia and archegonia are often important in systematic studies.

After fertilization the egg develops as the sporophyte and ruptures the archegonium. The outer part of the archegonium is carried upward on the tip of the capsule as the calyptra. The lower part remains to form the vaginula. The capsule in most mosses is elevated on a straight or curved seta of varying length, and it generally opens by a lid which falls off at maturity. The seta may be either smooth or papillose. The annulus, an elastic ring of specialized cells surrounding the rim, is present in most mosses and assists the process of rupture. The spores, which are generally exceedingly numerous, are rounded, smooth or rough, and surround the columella. The peristome, where present, consists either of a single circle of teeth or of two concentric circles. In the single circle the teeth are generally tinged with red. They vary in number from 4 to 64, in multiples of 4. In the peristome of two concentric circles the outer teeth are similar to those of the single type of peristome, but the inner peristome is of a more delicate texture and comprises 8 or 16 segments which generally alternate with the teeth, though in some species they may lie opposite them. The segments are either distinct to the base or more or less united below to form a basal membrane of varying height. This membrane, in some species, is prolonged between the segments into 1 to 3 delicate threadlike cilia.

Key to the families.

1. Leaves equitant and distichous .... 2.
 Leaves in 2 or more rows, often complanate but not distichous .... 3.
2. Leaves with a dorsal blade, costa single, strong ...... 2. FISSIDENTACEÆ.
 Leaves without a dorsal blade, costa faint and short.
 27. PHYLLOGONIACEÆ.
3. Branches in fascicles, leaf cells dimorphous, in one layer, the large hyaline cells in the meshes of a network of long narrow chlorophyllose cells .... 1. SPHAGNACEÆ.
 Branches not in fascicles, leaf cells mostly chlorophyllose, or, if large and hyaline, without fibers .... 4.
4. Leaf blade nearly all costa, with 3 or more layers of differentiated cells, small chlorophyllose cells (chlorocysts), and large hyaline porose cells (leucocysts) .... 5. LEUCOBRYACEÆ.
 Leaf blade composed of 1 or rarely 2 layers of similar cells, costa usually narrow .... 5.
5. Inner basal cells large and empty, sharply differentiated from the small chlorophyllose cells of the blade .... 6. CALYMPERACEÆ.
 Inner basal cells not conspicuously differentiated .... 6.
6. Leaves with longitudinal lamellæ on the inner face .... 7.
 Leaves without ventral lamellæ .... 8.
7. Peristome of 32 or 64 short teeth connected above with a membrane covering the mouth of the capsule .... 44. POLYTRICHACEÆ.
 Peristome a brushlike tuft of numerous filiform bristles.
 45. DAWSONIACEÆ.

8. Peristome teeth solid, not or faintly crossbarred.................. 9.
Peristome teeth thin, transversely barred and articulate .... 10.
9. Capsule irregular, calyptra small, naked.............. 43. BUXBAUMIACEÆ.
Capsule regular, calyptra large, densely pilose .... 44. POLYTRICHACEÆ.
10. Stems usually erect, dichotomously branched, setæ terminal on stems of leafy branches with few exceptions (acrocarpous)................ 11.
Stems creeping, often pinnate or copiously branched, setæ lateral on main stem or secondary branches (pleurocarpous).................. 23.
11. Calyptra large, campanulate, often pilose .... 12.
Calyptra small, cucullate .... 13.
12. Leaves with a single strong costa .... 18. ORTHOTRICHACEÆ.
Leaves ecostate .... 17. ERPODIACEÆ.
13. Leaves very inequilateral .... 12. DREPANOPHYLLACEÆ.
Leaves equilateral .... 14.
14. Peristome single or none .... 15.
Peristome double .... 18.
15. Peristome teeth broad at base, entire or cleft above..................... 16.
Peristome teeth divided into 32 filiform, papillose branches.............. 17.
16. Peristome teeth cleft above, leaf cells firm, alar leaf cells often differentiated .... 4. DICRANACEÆ.
Peristome teeth entire or none, leaf cells rhomboidal, very lax, alar cells not differentiated.. 8. FUNARIACEÆ.
17. Upper leaf cells smooth, elongate or quadrate.......... 3. DITRICHACEÆ.
Upper leaf cells papillose, rounded, often obscure .... 7. POTTIACEÆ.
18. Leaves broad, abruptly pointed, cells large, mostly over 20 μ wide.. 19.
Leaves narrow, lanceolate, acuminate, cells narrow, elongate......... 21.
19. Leaves firm, leathery, cells isodiametrical......................... 11. MNIACEÆ.
Leaves flaccid, cells elongate, very lax .... 20.
20. Autoicous, calyptra inflated below, leaves pointed, entire or serrulate.
8. FUNARIACEÆ.
Dioicous, calyptra not inflated, leaves small and rounded or coarsely toothed .... 9. SPLACHNACEÆ.
21. Capsules subglobose, striate, furrowed when dry.... 15. BARTRAMIACEÆ.
Capsules elongate, smooth... 22.
22. Upper leaf cells rhomboidal, elongate, seta terminal....... 10. BRYACEÆ.
Upper leaf cells rounded-quadrate, seta near base of stem.
13. RHIZOGONIACEÆ.
23. Stems with smaller differentiated dorsal or ventral leaves (amphigastria) .... 24.
Stems without amphigastria.. 25.
24. Leaves bordered, amphigastria on under side.... 33. HYPOPTERYGIACEÆ.
Leaves not bordered, amphigastria on upper side .... 19. RHACOPILACEÆ.
25. Costa single .... 26.
Costa double or none... 40.
26. Leaves conspicuously bordered.. 27.
Leaves not bordered.. 28.
27. Robust woody plants, leaves rigid, subulate-acuminate.
16. SPIRIDENTACEÆ.
Small flaccid plants, leaves short-pointed, cells lax.... 30. HOOKERIACEÆ.
28. Costa toothed on back above.. 29.
Costa smooth on back... 31.

29. Upper leaf cells short, rounded, incrassate .... 21. CYRTOPODACEÆ.
Upper leaf cells elongate, large dendroid plants .... 30.
30. Leaf margins faintly toothed, capsules smooth .... 25. PTEROBRYACEÆ.
Leaf margins spinose-serrate, capsules ribbed .... 14. HYPNODENDRACEÆ.
31. Leaf cells papillose .... 32.
Leaf cells smooth .... 34.
32. Stems prostrate, pinnate or bi- and tripinnate, stem and branch leaves often dimorphous .... 36. THUIDIACEÆ.
Stems pendulous or ascending, irregularly branched .... 33.
33. Slender plants, stems flexuose and pendulous .... 26. METEORIACEÆ.
Robust plants, stems rigid .... 23. TRACHYPODACEÆ.
34. Stems often regularly pinnate, leaves mostly very complanate. 28. NECKERACEÆ.
Stems irregularly branched, leaves not complanate .... 35.
35. Upper leaf cells short, parenchymatous .... 36.
Upper leaf cells elongate, prosenchymatous .... 37.
36. Capsules immersed .... 20. CRYPHÆACEÆ.
Capsules long-exserted .... 35. LESKEACEÆ.
37. Alar cells few, poorly differentiated .... 38.
Alar cells numerous, well defined .... 39.
38. Leaves short-pointed, deeply concave, stems julaceous. 29. LEMBOPHYLLACEÆ.
Leaves acuminate, lightly concave, stems not julaceous. 37. BRACHYTHECIACEÆ.
39. Slender, delicate plants, costa faint, leaves long-acuminate. 34. FABRONIACEÆ.
Coarser plants, costa strong, leaves short-pointed .. 39. PLAGIOTHECIACEÆ.
40. Leaves transversely undulate, strongly complanate .... 28. NECKERACEÆ.
Leaves not transversely undulate .... 41.
41. Capsules ribbed .... 22. PTYCHOMNIACEÆ.
Capsules not ribbed .... 42.
42. Capsules densely spinulose .... 31. SYMPHYODONTACEÆ.
Capsules not spinulose .... 43.
43. Alar cells sharply defined, often large and inflated .... 44.
Alar cells few, inconspicuous .... 47.
44. Leaves deeply cochleariform, apex cucullate .... 25. PTEROBRYACEÆ.
Leaves more or less concave, apex not cucullate .... 45.
45. Alar cells numerous, not colored, capsules cylindric, erect. 38. ENTODONTACEÆ.
Alar cells incrassate or colored, capsules ovoid .... 46.
46. Primary stems stoloniferous, alar cells numerous, incrassate. 24. MYURIACEÆ.
Primary stems not stoloniferous, alar cells mostly few, large, often inflated .... 40. SEMATOPHYLLACEÆ.
47. Mostly soft plants, calyptra large, mitriform, often hairy, forks of costa usually long .... 30. HOOKERIACEÆ.
Forks of costa short, calyptra usually cucullate .... 48.
48. Leaves plicate .... 25. PTEROBRYACEÆ.
Leaves not plicate .... 49.
49. Leaves cochleariform, abruptly short-pointed .... 29. LEMBOPHYLLACEÆ.
Leaves more or less concave, acuminate .... 50.

50. Endostome rudimentary, rigid woody plants.......... 25. PTEROBRYACEÆ.
    Peristome perfect, stems not woody.......... 51.
51. Leaf cells very wide and lax.......... 52.
    Leaf cells firm, narrow, elongate.......... 53.
52. Lid finely subulate-rostrate, peristome teeth with a median furrow, 32. LEUCOMIACEÆ.
    Lid short, apiculate, peristome teeth not furrowed (vesicularia). 41. HYPNACEÆ.
53. Leaves strongly complanate.......... 54.
    Leaves not complanate.......... 55.
54. Leaves, decurrent, cells smooth.......... 39. PLAGIOTHECIACEÆ.
    Leaves not decurrent, cells smooth or papillose at apical angles, 41. HYPNACEÆ.
55. Robust rigid plants, stems copiously branched..... 42. HYLOCOMIACEÆ.
    Smaller plants, stems often regularly pinnate.......... 41. HYPNACEÆ.

Order SPHAGNALES

Typical peat mosses, usually forming dense tufts or cushions in bogs or on wet mountain slopes, pale green tinged with brown or red.

Stems elongate, without radicles, composed of a central core of lax cells enclosed in a woody cylinder surrounded by one to several layers of large, thin-walled, hyaline cells. Branches in fascicles, crowded at tips of stems in dense heads. Branch leaves composed of two kinds of cells in one layer; a network of linear chlorophyllose cells in the meshes of which are large rhomboidal hyaline cells, usually porose and reinforced by spiral fibers. Stem leaves similar in structure but usually well differentiated in shape. Capsules dark brown, subglobose, with a convex lid, on a short, fleshy stalk or pseudopodium. Peristome none.

A very distinct order comprising a single genus, *Sphagnum*, of cosmopolitan distribution.

1. Family SPHAGNACEÆ

1. Genus SPHAGNUM Linn.

Sphagnum LINN., Sp. Pl. (1753) 1106.

Key to the species of Sphagnum.

1. Cortical cells of stems and branches fibrillose.......... 1. *S. japonicum*.
   Cortical cells of stems and branches not fibrillose.......... 2.
2. Plants glossy, hyaline leaf cells not fibrillose.......... 5. *S. sericeum*.
   Plants dull, hyaline leaf cells fibrillose.......... 3.
3. Chlorophyllose cells of branch leaves exposed only on inner surface of leaf.......... 6. *S. Junghuhnianum*.
   Chlorophyllose cells of branch leaves exposed on outer surface or on both surfaces.......... 4.

4. Branch leaves rounded or truncate at apex .... 4. *S. Robinsonii.*
Branch leaves pointed .... 5.
5. Branch leaves flattened when dry, with recurved tips, margins undulate .... 2. *S. cuspidatulum.*
Branch leaves concave when dry, tips erect, margins not undulate.
3. *S. luzonense.*

1. SPHAGNUM JAPONICUM Warnst. var. PHILIPPINENSE Warnst. Plate I, fig. 1.

Sphagnum japonicum Warnst. var. *philippinense* WARNST., Pflanzenreich 51 (1911) 469.

Rather robust, rigid, brittle plants, pale brown. Cortical cells of stem in three layers, fibrillose, porose; wood cylinder reddish brown. Stem leaves broadly lingulate, rounded, margins eroded above, hyaline cells not fibrillose, narrow below, toward apex as wide as, or wider than, long. Branches tumid, crowded, rather short, cortical cells in one layer, fibrillose; branch leaves ovate, deeply symbiform, gradually narrowed to a cucullate apex which is rough on the back by projecting cells; hyaline cells fibrillose, with several large pores on dorsal surface; chlorophyllose cells elliptic in section, enclosed or slightly exposed on inner surface.

LUZON, Isabela Province, *R. J. Alvarez 16906.*

Endemic.

As there are no important distinctions between this single collection and the cosmopolitan *S. palustre* L., I cannot escape the feeling that they will prove conspecific.

2. SPHAGNUM CUSPIDATULUM C. M. var. MALACCENSE Warnst. Plate I, fig. 2.

Sphagnum cuspidatulum C. M. var. *malaccense* WARNST., Pflanzenreich 51 (1911) 156.

Robust, pale or whitish-brown plants. Stems pale brown, cortical cells not or scarcely differentiated. Stem leaves triangular-lingulate, fimbriate, usually shallowly cleft at rounded apex; upper hyaline cells short, usually fibrillose. Divergent branches cuspidate at tips; branch leaves rather laxly imbricated, indistinctly 5-seriate, slightly concave or nearly flat when dry, with points widely spreading or recurved and margins lightly undulate, broadly ovate-lanceolate, margins involute above, apex slightly toothed, hyaline cells strongly fibrillose, with a few pores, chlorophyllose cells oval or triangular in section, exposed exclusively on dorsal side.

LUZON, Mountain Province, Mount Pulog, *Curran, Merritt & Zschokke 16305, 16410, Merrill 6402;* Suyoc to Pauai, *Merrill 4972;* Laguna Province, Mount Banahao, *Reyes 4385* in part.

Distribution: Himalayas, Celebes.

Very distinct from the local species in the flattened branch leaves with the points recurved when dry.

3. SPHAGNUM LUZONENSE Warnst. Plate 1, fig. 6.

Sphagnum luzonense WARNST., Bot. Centralbl. 76 (1898) 388.

Robust, pale-brown or grayish-green plants. Cortical cells of stem distinct, in one layer. Stem leaves small, about 1 mm long, broadly ovate, rounded and slightly lacerate at apex, narrowly bordered below, cells strongly fibrillose and porose. Branches crowded, concealing stem, divergent branches short, tumid, cuspidate; branch leaves closely imbricated, broadly ovate, rather blunt, deeply concave, toothed at apex, hyaline cells strongly fibrillose, with numerous small pores, chlorophyllose cells elliptical in section, exposed on both surfaces of leaf.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4911* (as var. *macrophyllum* Warnst.); Pauai, *Merrill 6678* (as var. *sordidum* Warnst.).

Endemic.

The deeply concave branch leaves with the hyaline cells richly porose will readily separate this species from *S. cuspidatulum*. I have not seen the typical plant collected by Loher, but the varieties based on the other two collections of record appear to be trivial forms which are likely to be effaced in a wider series of specimens.

4. SPHAGNUM ROBINSONII Warnst. Plate 1, fig. 4.

Sphagnum Robinsonii WARNST., Philip. Journ. Sci. § C 7 (1912) 257.

Robust plants, yellowish above, gray-brown below. Cortical cells of stem in two layers; wood cylinder brown. Stem leaves lingulate, narrowly bordered, up to 1.6 mm long, apex rounded, erose-denticulate, hyaline cells fibrillose and porose. Branches crowded, branch leaves closely imbricated, oblong-ovate, deeply concave, up to 2.3 mm long, apex rounded with 3 or 4 minute teeth, hyaline cells fibrillose with several large pores on both surfaces, chlorophyllose cells narrowly rectangular in section, exposed equally on both surfaces.

LUZON, Benguet Subprovince, Baguio, *Robinson 11996* (type).

Endemic.

A very distinct species in the broadly rounded or truncate branch leaves with the chlorophyllose cells exposed on both surfaces of the leaf.

4. SPHAGNUM SERICEUM C. M. Plate 1, fig. 5.

Sphagnum sericeum C. M., Bot. Zeit. (1847) 481.

Slender, delicate plants with an iridescent sheen. Cortical cells of stem in 2 or 3 layers; wood cylinder pale brown or yellowish. Stem leaves distant, triangular-lanceolate, rather abruptly short-acuminate, 1 mm long; hyaline cells without fibrils, several rows across base lax and short, linear and vermicular above. Branch leaves rather closely imbricated, ovate, abruptly short-acuminate, margins usually minutely denticulate toward apex; hyaline cells not fibrillose, often with a single pore in apical angle, chlorophyllose cells subcentral, exposed on both surfaces of leaf.

MINDORO, Mount Halcon, *Merrill 6161*.

Distribution: Sumatra, Java.

An attractive little plant sharply distinguished by its small size, its iridescent branch leaves, and the absence of fibrils in the hyaline cells.

5. SPHAGNUM JUNGHUHNIANUM Doz. & Molk. Plate 1, fig. 6.

Sphagnum Junghuhnianum Doz. & Molk. in Verhandel. d. Kon. Akad. v. Wetensch. (1854) 7

Robust, soft, pale-green or brownish plants. Stems elongate, cortical cells in 2 or 3 layers; wood cylinder brown. Stem leaves narrowly lingulate, 1.5 to 2 mm long, bluntly pointed, toothed at apex; cells fibrillose, lax toward base, several rows at margins linear, forming a narrow, indistinct border. Branches slender, attenuate, laxly foliate; branch leaves ovate-lanceolate, concave, margins inflexed above, apex narrowly truncate with 3 or 4 teeth, hyaline cells large, fibrillose, with large pores, chlorophyllose cells exposed on inner surface.

LUZON, Benguet Subprovince, Pauai, *M. S. Clemens 9314*, *Merrill 48097*, *McGregor 8078*; Baguio, *Robinson 14052*, *Elmer 8503*, *Williams 1069*; Mount Pulog, *Curran, Merritt & Zschokke 16416*, *16421*, *Mearns 3455*; Haight's in the Oaks, *Mearns 4540*; Sujoc to Pauai, *Merrill 4920*; Mount Data, *Merrill 4919*: Abra Province, Mount Paraga, *Ramos 7315*: Zambales Province, Mount Pinatubo, *Foxworthy 2540*: Laguna Province, Mount Banahao, *Copeland s. n.*: Pampanga Province, Camp Stotsenburg, *Elmer 22205*. MINDORO, Mount Halcon, *Merrill 5707*. MINDANAO, Davao Province, Mount Apo, Todaya, *Elmer 11360*, *Copeland "B."*

Distribution: Himalayas, Yunnan, Java, Celebes, Formosa, Japan.

The soft, lax habit and the chlorophyllose cells of the branch leaves exposed on the inner surface will readily separate this species from any of its congeners. It is apparently the only frequent and well-distributed species in the region. A number of forms are segregated in Warnstorf's paper, but they seem to be only minor variants and hardly amenable to classification.

Order BRYALES

A very large group, including the great majority of mosses. Spores and columnella developed from endothecium. Spore sac separated from capsule wall by a more or less evident air space. Capsules on a definite seta of varying length, indehiscent or opening by a lid, with or without a peristome.

Key to the tribes of Bryales.

Peristome teeth, when present, thin, with transverse articulations.
1. ARTHRODONTEÆ.
Peristome teeth thick, solid, not transversely articulated.
2. NEMATODONTEÆ.

1. Tribe ARTHRODONTEÆ

Peristome teeth, when present, relatively thin, with transverse articulations, developed from a single layer of sporogonium.

Key to the subtribes of Arthrodonteæ.

Peristome single, outer plates not divided, inner plates with a vertical median line .... 1. HAPLOLEPIDEÆ.
Peristome double, outer plates with a median line, inner plates not divided.
2. DIPLOLEPIDEÆ.

1. Subtribe HAPLOLEPIDEÆ

Peristome none or single, teeth often cleft or bifid, composed of two layers of plates below; outer plates not divided, inner plates divided vertically by a fine median line. Fruit, with few exceptions, terminal. Stems mostly erect.

2. Family FISSIDENTACEÆ

Small to fairly robust plants with distichous equitant leaves flattened in one plane, split to costa on inner side of lower half into two blades clasping stem. Leaf cells uniform, in one layer, hexagonal or rounded. Costa ending in or below apex. Setæ terminal or lateral. Capsule erect or inclined, with a simple peristome of 16 teeth split to or below middle into two subulate forks. Spores small.

2. Genus FISSIDENS Hedw.

Fissidens Hedw., Sp. Musc. (1801) 152.

The genus comprises a natural and distinct group of plants characterized by the leaf structure for which the following terms are used: "duplicate blades," sheathing basal part facing the stem; "apical blade," the part above the duplicate blades on the same side of the costa; "dorsal blade," the entire part on the opposite side of the costa.

The Philippine species are all included in the subgenus *Eufissidens* and may be grouped in the following recognized sections:

Weberiopsis C. M. Small flaccid plants, leaves narrowly bordered all around, cells lax, elongate, costa ending far below apex.
F. splachnobryoides Broth.

Bryoidium C. M. Small plants, leaves narrowly bordered all around, cells isodiametrical.
F. Schmidii C. M.; *F. Zollingeri* Mont.; *F. xiphioides* Fl.

Semilimbidium C. M. Small plants, upper leaves bordered only on duplicate blades, cells small, papillose.
F. Hollianus Doz. & Molk.; *F. Elmeri* Broth.; *F. rizalensis* Bartr.

Aloma C. M. Small plants, leaves not bordered, margins crenulate, cells relatively large, hexagonal, pellucid.
F. Mittenii Par.; *F. Robinsonii* Broth.; *F. diversiretis* Bartr.

Crispidium C. M. Small plants, leaves not bordered, margins crenulate, cells small, papillose.
F. Braunii (C. M.) Doz. & Molk.; *F. sylvaticus* Griff.

Serridium C. M. Mostly robust plants, leaves not bordered with elongated cells but occasionally with a thickened border of short cells, usually serrate above, cells rounded, seta usually lateral.
F. nobilis Griff.; *F. anomalus* Mont.; *F. nagasakinus* Besch. var. *luzonensis* Broth.; *F. pulogensis* Broth.; *F. areolatus* Griff.

Key to the species of Fissidens.

1. Leaves bordered with a pale narrow band of elongated cells .... 2.
   Leaves not bordered with elongated cells .... 8.
2. Leaves bordered only on duplicate blades .... 3.
   Leaves bordered all around .... 5.
3. Leaf apex rounded, costa ending well below apex .... 5. *F. rizalensis.*
   Leaf apex acuminate, costa percurrent .... 4.
4. Cells unipapillate, seta smooth .... 6. *F. Elmeri.*
   Cells pluripapillate, seta more or less scabrous .... 7. *F. Hollianus.*
5. Leaf cells lax, elongate, costa ending far below apex.
   1. *F. splachnobryoides.*
   Leaf cells small, isodiametrical, costa percurrent .... 6.
6. Leaf cells obscure, papillose .... 2. *F. Schmidii.*
   Leaf cells distinct, smooth .... 7.
7. Dioicous, leaves ovate-lanceolate .... 3. *F. Zollingeri.*
   Autoicous, leaves narrower .... 4. *F. xiphioides.*

8. Small plants, less than 1 cm high.. 9.
Robust plants, over 1 cm high.. 13.
9. Leaf cells papillose, small and obscure.. 10.
Leaf cells smooth, relatively large and pellucid.. 11.
10. Autoecous, leaf cells coarsely papillose.. 8. *F. Braunii.*
Dioicous, leaf cells finely papillose.. 9. *F. sylvaticus.*
11. Leaves up to 1 mm long, bluntly acuminate.. 10. *F. Mittenii.*
Leaves 2 mm or more long, sharply acuminate.. 12.
12. Leaf cells under 10 μ long, rather obscure.. 11. *F. Robinsonii.*
Leaf cells up to 35 μ long, lax and pellucid.. 12. *F. diversiretis.*
13. Leaves with a thickened border.. 13. *F. nobilis.*
Leaf border not thickened.. 14.
14. Marginal leaf cells pale, distinctly differentiated.. 14. *F. anomalus.*
Marginal leaf cells not or scarcely differentiated.. 15.
15. Leaf cells small, 4 μ, obscure.. 15. *F. nagasakinus.*
Leaf cells larger, translucent.. 16.
16. Leaves acute, margins serrulate.. 16. *F. pulopensis.*
Leaves blunt and apiculate, margins subentire.. 17. *F. areolatus.*

1. **FISSIDENS SPLACHNOBRYOIDES** Broth. Plate 1, fig. 10.

Fissidens splachnobryoides BROTH. in Fleisch. Laubmfl. Java 1 (1900–1902) 21.

Dioicous; rather robust, flaccid, closely gregarious plants, dull yellowish green. Stems up to 1 cm long and 4 to 5 mm wide including leaves. Leaves lightly contorted when dry, in 10 or more pairs, oblong-lanceolate, short-acuminate, up to 3.5 mm long, bordered all around with 3 to 5 rows of narrow linear cells, dorsal blade tapering below and usually ending above leaf insertion; costa brownish, ending considerably below apex; cells lax, prosenchymatous, oval-rhomboidal, to 12 μ wide and 35 μ long.

LUZON, Rizal Province, near Antipolo, Hinulugan Taktak (waterfall), *Bartlett 15259, 15260, 15265, 15270, 15277.*

Distribution: Java, New Guinea.

The lax, elongated leaf cells and the costa ending far below the apex will readily separate this species from any of its allies with bordered leaves. As far as I can see it is impossible to segregate the local collections from *F. splachnobryoides* Broth. as represented by Fleischer.[1]

2. **FISSIDENS SCHMIDII** C. M. Plate 1, fig. 1.

Fissidens Schmidii C. M., Bot. Zeit. (1853) 13.

Small, yellowish, laxly gregarious plants. Stems procumbent, 3 to 4 mm long, 1.5 to 2 mm wide including leaves. Leaves deflexed, strongly contorted when dry, ovate lanceolate, short-acuminate, about 1 mm long and 0.35 mm wide, decreasing in size below, bordered all around with a narrow cartilaginous band of linear cells; costa brown or yellowish, percurrent, margins often distinctly crenulate near apex and on duplicate blades; leaf cells obscure, papillose, irregularly quadrate, with firm, pale walls, 5 to 7 μ in diameter. Seta terminal, usually geniculate at base, 5 to 6 mm long, pale brown; capsule horizontal, urn 0.6 mm long; peristome teeth brownish, with coarsely papillose and spirally thickened forks; spores smooth, 8 to 10 μ in diameter.

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[1] Musc. Archip. Ind. No. 551.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1786*; Bontoc Subprovince, *Vanoverbergh 1352*.

Distribution: Nilghiri, Ceylon, Java.

Small, inconspicuous plants, differing from the two following species principally in the smaller, obscure, papillose leaf cells.

2. **FISSIDENS ZOLLINGERI** Mont. Plate 1, fig. 7.

Fissidens Zollingeri MONT., Ann. Sci. Nat. 4 (1845) 114.

Dioicous; small, densely tufted, sordid-green plants. Stems laxly ascending, up to 5 mm long, radiculose and matted together below, 2 to 2.5 mm wide, including leaves. Leaves slightly contorted when dry, narrowly oblong-lanceolate, acuminate, 1.5 mm long and 0.25 mm wide, duplicate blades extending to midleaf, dorsal blade ending in a rounded lobe at insertion; margins entire; costa yellowish, excurrent in a short cuspidate point; border narrow, cartilaginous, extending all around leaf; leaf cells smooth, rather lax, hexagonal, 10 to 14 μ in diameter, with firm, yellowish walls. Seta terminal, 4 to 5 mm long, pale brown, capsule erect, ovoid-cylindric, constricted below mouth when dry, urn 0.5 mm long; peristome teeth brown, incurved, forks spirally thickened; lid conic-rostrate, as long as urn; spores smooth, 10 to 12 μ in diameter.

LUZON, Bataan Province, Lamao, *Merrill 3500*, *Bartlett 14023*; Laguna Province, Los Baños, *Baker 21381*; Rizal Province, Montalban, *Bartlett 14494*; Tayabas Province, Mauban, *Pastrana 37*; Zambales Province, Mount Ilingin, *Ebalo 58*; Pannubuan, *Bartlett 14226*.

Distribution: Java, Sumatra, Hongkong, Andaman Islands, Tahiti.

A species of wide distribution but apparently not common in the local flora.

6. FISSIDENS XIPHIOIDES Fleisch. Plate 1, fig. 6.

Fissidens xiphioides FLEISCH., Hedwigia 38 (1899) 125.

Very similar in general appearance and structural details to *F. Zollingeri* but autoicous, with the stalked antheridial buds in the leaf axils. The leaves are narrowly lanceolate and the cells of the duplicate blades laxer and more hyaline, with thin, delicate walls.

LUZON, Rizal Province, Montalban, *Bartlett 14509* in part: Bataan Province, Lamao River, *Bartlett 14649:* Benguet Subprovince, Kias Hill, Benguet Road, *Williams 1789:* Laguna Province, Mount Maquiling, *Bartlett 15626, 15658, 15659, 15727.*

Distribution: Java.

This and the preceding species are closely allied, but *F. xiphioides* is usually well characterized by the narrower leaves and autoicous inflorescence.

7. FISSIDENS RIZALENSIS Bartram sp. nov. Plate 2, fig. 21.

Dioicous: plantae minutae, gregariae. Caulis perbrevis, 1 ad 2 mm longus. Folia 5 ad 7 juga, sicca crispata, oblongo-ovata, apice obtuse rotundata, vix 1 mm longa; limbo laminae duplicatae e 3 seriebus cellularum composito, lamina dorsali et apicali elimbata; costa infra apicem evanida, cellulae minutae, subquadratae, dense palillosae. Seta 1.5 ad 2 mm longa; capsula erecta.

Dioicous; minute, dull yellowish-green corticolous plants. Stems 1 to 2 mm long and about 1.5 mm wide with leaves. Leaves crispate when dry, oblong-ovate, obtusely rounded at apex, scarcely 1 mm long; duplicate blades bordered with 3 rows of narrow, pellucid cells, dorsal and apical blades not bordered, margins minutely papillose crenulate all around, dorsal blade tapering toward insertion and slightly decurrent; costa ending 8 to 10 cells below apex; cells small and dense, minutely papillose, rounded quadrate, 2 to 6 μ in diameter. Seta 1.5 to 2 mm long, often geniculate at base; capsule erect, oblong, urn 0.5 mm long; lid rostrate, more than half length of urn.

LUZON, Rizal Province, Kay Ungulan, near Teresa, *Bartlett 15311* in part, *15312* (type).

A very distinct species that will be easily distinguished from *F. Hollianus* by the smaller size and especially by the rounded leaf apices with the costa ending well below the apex.

6. FISSIDENS ELMERI Broth. *Plate 1, fig. 10.*

Fissidens Elmeri BROTH., Leafl. Philip. Bot. 2 (1909) 652.

Small, loosely gregarious plants, yellowish green tinged with brown. Stems up to 5 mm long with 6 to 10 pairs of leaves. 1 to 1.5 mm wide including leaves. Upper leaves 1 to 1.5 mm long, smaller below, erect-spreading with falcate or contorted tips, narrowly oblong-lanceolate, acuminate, dorsal blade ending in a rounded lobe at insertion, apical and dorsal blades not bordered, margins minutely and sharply serrulate; duplicate blades bordered with 3 to 4 rows of pale, linear cells; costa pale, nearly percurrent; leaf cells of apical and dorsal blades minute, rounded, 5 to 6 μ, obscure, sharply unipapillate. Seta pale, smooth, geniculate at base, about 2.5 mm long; capsule erect, ovoid-cylindric, urn 0.5 mm long; forks of peristome teeth spirally thickened, brown; spores pale, smooth, 10 to 12 μ in diameter.

DALUPIRI ISLAND, Babuyan Group, *Bartlett 15112.* NEGROS, Cuernos Mountains, *Elmer 10320* (type).

Endemic.

Closely allied to *F. Hollianus*, but apparently distinct in the sharply unipapillate leaf cells.

7. FISSIDENS HOLLIANUS Doz. & Molk. *Plate 1, fig. 11.*

Fissidens Hollianus DOZ. & MOLK., Bryol. Jav. 1 (1855) 4, *t. 4.*

Small, pale-green, gregarious plants. Stems 4 to 5 mm long with 10 to 12 pairs of leaves, about 2 mm wide with leaves. Lower leaves minute, upper oblong, short-acuminate, dorsal blade rounded at insertion, up to 1.2 mm long, bordered only on duplicate blades, margins of apical and dorsal blades minutely crenulate; costa pale, percurrent; cells quadrate-hexagonal with firm, pale walls, minutely pluripapillate, 5 to 7 μ in diameter; 3 to 4 rows of pale, elongated cells bordering duplicate blades of upper leaves. Seta up to 5 mm long, pustulose or essentially smooth; capsule inclined, ovoid.

LUZON, Cagayan Province, Magapit, *Bartlett 14884;* Rizal Province, Montalban, *Bartlett 14416;* Laguna Province, Mount Maquiling, *Bartlett 15629.*

On trees, uncommon. Many of the species included in the section *Semilimbidium* have the lower leaves entirely unbordered, so the upper leaves should be examined for this feature.

FISSIDENS HOLLIANUS Doz. & Molk. var. **ASPERISETUS** (Lac.) Fleisch.

Fissidens Hollianus Doz. & Molk. var. *asperisetus* (Lac.) FLEISCH., Laubm. Java 1 (1900–1902) 34.

Fissidens asperisetus LAC., Sp. Nov. Musc. Archip. Ind. (1872) 2.

Distinguished from the typical plants by the distinctly scabrous setæ.

LUZON, Laguna Province, Mount Maquiling, *Herklots P. 25*.

4. **FISSIDENS BRAUNII** (C. M.) Doz. & Molk. Plate 1, fig. 12.

Fissidens Braunii (C. M.) Doz. & Molk., Bryol. Jav. 1 (1855) 1.
Conomitrium Braunii C. M., Syn. 2 (1851) 527.

Small yellowish or pale-brown plants, laxly gregarious. Stems up to 5 to 6 mm long, often denuded of leaves below, sparingly radiculose at base, 2 mm wide with leaves. Leaves crowded, slightly contorted with points often deflexed when dry, ligulate, bluntly acute or obtuse, up to 1.5 mm long, not bordered, dorsal blade ending abruptly at insertion, margins crenulate-serrulate all around; costa pale, ending just below apex; leaf cells rounded, dense, obscure, 4 to 5 μ in diameter, coarsely papillose or mamillose. Seta terminal, short, flexuose, 1.5 to 2 mm long; capsule ovoid-cylindric, erect, urn 0.4 mm long; lid conic-rostrate, nearly as long as urn; peristome teeth reddish, forks slender, papillose, spirally thickened; spores 10 to 12 μ in diameter.

LUZON, Benguet Subprovince, Baguio, *Williams 1790:* Laguna Province, Mount Maquiling, *Robinson 17018*. MINDANAO, Sax River, *Williams 2388*.

Distribution: Java.

The small size, unbordered leaves, and dense, opaque areolation, will distinguish this species from all of its allies except *F. sylvaticus*, which is distinct in the longer, more sharply pointed leaves, strongly curled and contorted when dry, and the more clearly defined leaf cells.

5. **FISSIDENS SYLVATICUS** Griff. Plate 1, fig. 13.

Fissidens sylvaticus Griff., Not. 429; Ic. Pl. Asiat. 2 (1849) t. 61, f. 1.
Fissidens Zippelianus Doz. & Molk., Zoll. Syst. Verz. (1854) 29.

Rather small, closely gregarious, yellowish or pale-brown plants. Stems 3 to 4 mm long, 2.5 mm wide, including leaves. Leaves crowded, strongly contorted with circinnate apices when dry, erect-spreading with falcate points when moist, narrowly lanceolate, acuminate, up to 2 mm long, unbordered, dorsal blade tapering slightly below and ending abruptly at leaf insertion; margins minutely crenulate all around; costa pale, percurrent; leaf cells irregular, rounded-hexagonal or transversely oval, 5 to 8 μ, minutely papillose, marginal row smaller. Seta terminal, 3 to 4 mm long, geniculate at base; capsule erect, ovoid-cylindric, urn up to 0.7 mm long; spores 10 to 12 μ in diameter.

BATAN ISLAND, *Bartlett 15455*. LUZON, Bataan Province, Lamao, *Bartlett 14129, 14131, 14092, Merrill 3554, 3555, Williams 3180, Bartlett 14024, Curran 15564:* Rizal Province, Montalban, *Bartlett 14380, 14382:* Bontoc Subprovince, *Vanoverbergh 1260;* Lebayet, *Leiberg 1254a:* Laguna Province, Nagcarlan, *Bartlett 15202;* Mount Maquiling, *Bartlett 15653:* Cavite Province, Silang and Balete, *Bartlett 14791, 14792:* Tayabas Province, Mauban, *Pastrana 3, 7, 16, 30, 78, 81:* Zambales Province, Olongapo, *Ebalo 29, 30, 42, 45, 51, 56;* Pannubuan, *Bartlett, 14228;* Subic, *Bartlett 14065*.

Distribution: Siam, Sumatra, Java, Celebes, Borneo, Hongkong.

Note remarks under *F. Braunii* for distinctions between these two species.

Williams has recorded Leiberg's *1254a* as *F. involutus* Wils., but I fail to find any noteworthy distinctions between these plants and *F. sylvaticus*.

F. sylvaticus is frequent in Luzon and quite polymorphous, but may usually be recognized by the unbordered, sharply pointed leaves with strongly curled apices when dry.

10. FISSIDENS MITTENII Par. Plate 1, fig. 14.

Fissidens Mittenii PAR., Ind. Bryol. 1 (1894) 477.

Small, gregarious plants, yellowish tinged with reddish brown. Stems up to 7 to 8 mm long, 1.5 mm wide including leaves. Leaves erect-spreading, lightly contorted when dry, oblong-lanceolate, short-acuminate, scarcely 1 mm long, unbordered, dorsal blade rather broad, scarcely tapering below, ending abruptly at leaf insertion; margins minutely crenulate; costa brownish, percurrent; leaf cells laxly hexagonal, convex on free surfaces but hardly mamillose, very distinct, 10 to 12 μ in diameter, marginal row much smaller, walls firm, yellowish. Seta up to 2.5 mm long; capsule slightly inclined.

LUZON, Rizal Province, Kay Ungulan, near Teresa, *Bartlett 15332*. POLILLO, *Leiberg 1252*.

Distribution: Ceylon, Siam, Singapore, Sumatra, Java.

Well marked by the small, bluntly pointed leaves and lax, pellucid areolation. The Luzon collection represents a small form with short, nearly acaulescent stems, but is characteristic in other particulars.

11. FISSIDENS ROBINSONII Broth. Plate 5, fig. 15.

Fissidens Robinsonii BROTH., Philip. Journ. Sci. § C 13 (1918) 204.

Medium-sized, yellowish-green, densely gregarious plants. Stems up to 7 to 8 mm long, sparsely radiculose at base, 2.5 to 3 mm wide including leaves. Leaves crowded, lightly contorted, with tips curved or hooked when dry, erect-spreading when moist, ligulate-lanceolate, acuminate, 2 to 2.5 mm long, unbordered, dorsal blade ending abruptly at leaf insertion; margins minutely crenulate all around; costa pale, percurrent; leaf cells irregularly hexagonal, 6 to 9 μ in diameter, rather dense but distinct, convex on free surfaces, minute toward margins, gradually larger toward costa.

PANAY, Iloilo Province, Salug River, *Robinson 18105* (type).

Endemic.

Known only from the type collection. The longer leaves, hooked at the apex, and the smaller cells will separate the species from *F. Mittenii*.

12. FISSIDENS DIVERSIRETIS Bartram sp. nov. Plate 2, fig. 22.

Dioicous, pusillus. Caulis 1 to 1.5 mm longus. Folia 4 vel 5, juga, sicca leviter curvata, superiora multo majora, ad 2 mm longa, anguste lanceolata, acuminata, elimbata, ubique grosse denticulata; cellulae hexagonae, pellucideae, chlorophyllosae, ad 10 μ latae et 35 μ longae, margines versus multo minores, rotundatae; costa percurrente. Seta 3 ad 3.5 mm longa; capsula erecta.

Dioicous; small slender plants, closely gregarious, yellowish green. Stems 1 to 1.5 mm long. Lower leaves small, upper much larger, up to 2 mm long, narrowly lanceolate, sharply acuminate, unbordered, coarsely and bluntly toothed all around by projecting marginal cells, dorsal blade tapering below and ending at leaf insertion; costa percurrent; cells smooth, large, pellucid, chlorophyllose, hexagonal, up to 10 μ wide and 35 μ long near costa, much smaller and rounded in marginal row. Seta slender, yellowish, 3 to 4 mm long; capsule small, oblong, erect; peristome deep red.

LUZON, Laguna Province, middle elevations of Mount Maquiling, mostly above hot mud springs and entirely below mossy forest, *Bartlett 15697*.

Endemic.

Quite distinct from *F. Mittenii* in the longer, narrower, sharply acuminate leaves, and the larger, more elongate juxta-costal cells.

13. FISSIDENS NOBILIS Griff. Plate 2, fig. 16.

Fissidens nobilis GRIFF., Not. 427; Ic. Pl. Asiat. 2 (1841) *t. 83.*

Robust, yellow or brownish plants of frondose habit, growing in loose tufts. Stems erect, up to 4 cm long or longer, 7 to 8 mm wide with leaves. Leaves slightly contorted when dry, crowded, ligulate, short-acuminate, up to 7 to 8 mm long and 1.5 mm wide, with a thickened border all around, dorsal blade wide, hardly tapering below, about 0.3 mm wide at leaf insertion and strongly decurrent; margins irregularly toothed in upper half, entire below; costa strong, brownish, percurrent; cells distinct, irregularly hexagonal, moderately incrassate, minutely papillose, 8 to 10 µ in diameter, in several layers toward margins forming a distinct border. Seta lateral, 6 to 8 mm long, capsule inclined, ovoid-cylindric, urn 2 mm long; lid conic-rostrate, as long as urn.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4995;* Baguio, *Baker 21833, Williams 1788, Merrill 7827;* Sablang, *Fenix 12805:* Bontoc Subprovince, *Vanoverbergh 546:* Rizal Province, Bosoboso, *Ramos 991:* Abra Province, Mount Posuey, *Ramos 27089:* Laguna Province, Mount Maquiling, *Baker 7014.* NEGROS, Negros Oriental Province, Dumaguete, Cuernos Mountains, *Elmer 9964, Chapman 87;* Canlaon Volcano, *Merrill 6831.* PALAWAN, altitude 4 to 5 meters, *Merrill 7269.* POLILLO, *McGregor 10516.*

Distribution: Himalayas, Sumatra, Java, Hongkong.

A splendid plant, characterized at once by the large size and the thickened leaf border.

14. FISSIDENS ANOMALUS Mont. Plate 2, fig. 18.

Fissidens anomalus MONT., Ann. Sci. Nat. (1842) 252.

Robust, densely tufted plants, yellowish tinged with brown. Stems laxly erect, up to 4 cm long, about 6 mm wide including leaves. Leaves strongly contorted when dry, with inrolled apices, ligulate, short-acuminate, up to 5.5 mm long and 1 mm wide, bordered all around with several rows of differentiated cells in one layer, with pellucid, thickened walls, dorsal blade ending in a round lobe at leaf insertion; margins irregularly toothed in upper half; costa strong, percurrent; leaf cells dense, rather opaque, not at all incrassate, tumid on free surfaces. Perichætial leaves abruptly subulate-acuminate, hardly 2 mm long; setæ lateral, short, 1.5 to 2 mm long; capsule erect, oblong, deep brown, barely exceeding leaves, urn 1.5 mm long; lid conic-rostrate, oblique; peristome teeth reddish, with slender, strongly nodose forks; calyptra cucullate, barely extending below rim; spores brownish, minutely papillose, 15 to 20 μ in diameter.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1787*; Pauai, *McGregor 8682*; Haight's in the Oaks, *Mearns 4545*.

Distribution: India, Ceylon, Java.

This plant is distinguished at a glance from the other local species of robust habit by the leaf border of incrassate, pale-walled cells.

15. FISSIDENS NAGASAKINUS Besch. var. LUZONENSIS Broth. Plate 2, fig. 15.

Fissidens nagasakinus Besch. var. *luzonensis* BROTH., Philip. Journ. Sci. § C 13 (1918) 204.

Moderately large yellowish-brown plants, laxly tufted. Stems up to 2.5 cm long, simple or branched, about 4 mm wide with leaves. Leaves contorted, with strongly crisped or inrolled apices when dry, ligulate, acute or short-acuminate, up to 3 mm long, not bordered, dorsal blade slightly tapering below and clearly decurrent; margins minutely serrulate; costa pale, percurrent or ending just below apex; leaf cells small, opaque and obscure, minutely papillose, rounded-hexagonal, 4 to 7 μ in diameter, with firm walls. Sporophyte unknown.

LUZON, Benguet Subprovince, Baguio, *Merrill 7851*.

Endemic.

The narrower leaves and appreciably smaller, opaque leaf cells will serve to separate this species from *F. pulogensis*.

16. FISSIDENS PULOGENSIS Broth. Plate 2, fig. 16.

Fissidens pulogensis BROTH., Philip. Journ. Sci. § C 5 (1910) 141.

Robust yellowish or pale-brown plants growing in lax tufts. Stems up to 3 cm long, simple or branched, 5 to 6 mm wide, including leaves. Leaves lightly contorted with crispate points when dry, oblong-lanceolate, abruptly short-acuminate, up to 3.5 mm long and 1 mm wide, not or scarcely bordered, dorsal blade broad, ending in a rounded lobe at leaf insertion; margins minutely serrulate all around; costa yellowish, ending in or just below apex; leaf cells distinct, hexagonal, 10 to 13 μ in diameter, slightly convex on free surfaces, incrassate, 1 or 2 rows at margins sometimes faintly differentiated by slightly thickened, pellucid walls, but not forming a distinct border.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merrill & Zschokke 16396* (type); Pauai, *Merrill 4957*.

Endemic.

This plant is closely allied to *F. anomalus*, but the leaves lack the characteristic pellucid border of that species and the leaf margins are minutely serrulate instead of coarsely and irregularly toothed.

17. **FISSIDENS AREOLATUS** Griff.

Fissidens areolatus GRIFF., Not. 428; Ic. Pl. Asiat. 2 (1841) 83, pl. 2.

Tall, frondose plants, yellowish or pale brown, growing in lax tufts. Stems up to 5 cm long, flexuose, 6 to 7 mm wide with leaves. Leaves lightly contorted but noticeably secund when dry, oblong-ligulate, broadly rounded at apex and usually bluntly apiculate, 4 to 5 mm long and 1 mm wide, not bordered, dorsal blade ending in a rounded lobe at insertion; margins minutely crenulate all around; costa ending just below apex or sometimes percurrent; leaf cells distinct, rounded-hexagonal, 10 to 15 μ in diameter, incrassate, smooth.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4948*.

Distribution: Sikkim, Khasia, Burma.

In a close monographic study of the genus I doubt if this species can be adequately separated from *F. polypodioides* Hedw., which frequently shows the same form of leaf apex. There seems to be no appreciable difference in the size of the leaf cells, which measure up to 12 to 15 μ in diameter in both species.

3. Family DITRICHACEÆ

Small, rather densely tufted plants. Stems short, erect. Leaves narrow, lanceolate; margins entire or slightly toothed near apex; costa percurrent or excurrent; cells smooth, linear or subquadrate above, scarcely differentiated at basal angles. Seta erect; capsule erect or inclined, smooth or sulcate; peristome simple, reddish, composed of 16 teeth from a short basal membrane, divided nearly to base; lid conic or conic-rostrate; annulus broad; spores small.

Key to the genera of Ditrichaceæ.

1. Seta very short, capsule immersed.. 3. *Garckea.*
   Seta elongate, capsule long, exerted.. 2.
2. Upper leaf cells linear, capsules smooth.. 4. *Ditrichum.*
   Upper leaf cells subquadrate, capsule furrowed when dry.
   5. *Ceratodon.*

3. Genus GARCKEA C. M.

Garckea C. M., Bot. Zeit. (1845) 865.

Small, slender, yellowish-green plants growing in loose tufts. Stems erect, slightly radiculose at base. Lower leaves small, distant, erect, upper leaves larger, crowded, comose, lanceolate; margins entire, slightly recurved; costa strong, excurrent; leaf cells linear, more lax near base. Capsule immersed on a short, erect seta; peristome simple, teeth divided almost to short basal membrane, papillose.

GARCKEA PHASCOIDES (Hook.) C. M. Plate 2, fig. 23.

Garckea phascoides (Hook.) C. M., Bot. Zeit. (1845) 865.
Dicranum phascoides Hook., Misc. Bot. 1 (1830) 39, *pl. 21*.

Dioicous; slender, dull yellowish-green plants, loosely tufted. Stems erect, 1.2 to 2 cm long, simple. Upper leaves crowded in conspicuous comal tufts, narrowly lanceolate, long and slenderly acuminate, up to 3 mm long; margins entire, often narrowly recurved in upper half; costa 35 to 40 µ wide below, excurrent; leaf cells linear, slightly incrassate, shorter and laxer at extreme base; lower leaves smaller, distant 1 to 1.5 mm long. Perichætial leaves similar to comal leaves; capsule immersed on a short, erect seta about 0.25 mm long, urn oblong-cylindric, annulus broad; peristome teeth reddish brown, inserted below rim, coarsely papillose, cleft about two-thirds down into 2 or 3 irregularly united forks; lid conic-rostrate, about half as long as urn; calyptra small, campanulate, usually scabrous; spores brownish, minutely papillose, 15 µ in diameter.

LUZON, Rizal Province, Kay Ungulan, near Teresa, *Bartlett 15390*; Bataan Province, Lamao, *Williams 881*; Benguet Subprovince, Loakan near Baguio, *Williams 1808*; Zambales Province, Olongapo, *Ebalo 31*. CULION, Calamian Group, between Culion and "Negative Barrio," *Bartlett 15522, 15526*.

Distribution: Wide in south Asia and Malaysia.

The slender habit, narrow, finely pointed leaves in comal tufts, and the immersed fruit, will readily identify this plant.

4. Genus DITRICHUM Hampe

Ditrichum Hampe, Flora 50 (1867) 182.

Small, tufted, yellowish-green plants. Stems erect. Leaves long subulate-acuminate from a short, ovate base, often flexuose or secund; costa usually broad below, percurrent or excurrent; leaf cells linear, not differentiated at basal angles. Capsule erect or nodding, on a long, slender seta, often narrowed toward mouth; peristome teeth divided to short basal membrane into 2 filiform, papillose, or spirally striolate forks; lid conic-rostrate, spores small.

DITRICHUM FLEXIFOLIUM (Hook.) Hampe. Plate 2, fig. 14.

Ditrichum flexifolium (Hook.) HAMPE, Flora 50 (1867) 182.
Dicranum flexifolium HOOK., Musc. Exot. (1820) *pl. 144*.
Trichostomum difficile DUBY, Moritzi, Verz. d. Zoll. Pfl. (1845–1846) 134.

Autoicous; small terrestrial plants, tufted, yellowish or sordid green, slightly glossy. Stems 2 to 3 mm high, scarcely radiculose. Leaves long and finely subulate-acuminate, 3 to 4 mm long, from a short-ovate base, erect, canaliculate, often secund when dry; margins erect, entire; costa about 120 μ wide at base, often poorly defined below, occupying most of subula and usually excurrent with a few blunt teeth near tip; leaf cells linear, smooth, with yellowish pellucid walls. Seta erect, elongate, variable in length, up to 3 cm long, reddish; capsule slightly nodding, bright reddish brown, cylindric, smooth, narrowed at mouth, urn 1.5 to 2 mm long; lid conic-rostrate, barely 1 mm long; annulus broad; calyptra cucullate, extending about halfway down urn; peristome pale, teeth from a short basal membrane cleft to base into 2 filiform, densely papillose forks; spores pale, smooth, 10 to 12 μ in diameter.

LUZON, Benguet Subprovince, Mount Data, *Ramos 5957*; Mount Santo Tomas, *Hadden 101*, *Bartlett 13394*, *Clemens 51912*; Baguio, *Merrill 7847*, *Williams 1815*, *Robinson 14063*, *Ramos 5860*, *Curran & Merritt 15769*; Pauai, *McGregor 8692*; Laguna Province, Mount Banahao, *Merrill 7527*. NEGROS, Canlaon Volcano, *Merrill 6805*, *6820*, *6828*.

Distribution: Africa, Malaysia, Tasmania, New Zealand, New Caledonia, South America.

A rather variable plant of wide distribution and commonly a free fruiter. It is readily recognized by the inclined reddish-brown capsules, slightly asymmetrical and narrowed at the mouth, the long fine setae, and the silky flexuose leaves.

5. Genus CERATODON Brid.

Ceratodon BRID., Bryol. Univ. 1 (1826) 480.

Small, tufted, sordid or yellowish-green plants with erect stems. Leaves crowded, ovate-lanceolate, acuminate; costa strong, percurrent or excurrent; leaf cells smooth, subquadrate above, rectangular toward base. Seta slender, elongate; capsule erect or inclined, furrowed when dry, slightly strumose at base; peristome simple from a short basal membrane, teeth divided nearly to base, forks nodose, narrowly bordered below by wider and paler inner plates; spores small.

CERATODON STENOCARPUS C. M. Plate 2, fig. 25.

Ceratodon stenocarpus C. M., Syn. 1 (1849) 647.

Dioicous; small, yellowish or dull-green plants, densely tufted. Stems erect, 5 mm high or higher. Leaves slightly crispate and flexuose, narrowly ovate-lanceolate, canaliculate, gradually acuminate; margins revolute from a little below apex nearly to base, denticulate toward point; costa strong, percurrent; upper cells smooth, subquadrate, incrassate, basal cells elongate toward costa and quadrate toward margins. Perichætial leaves abruptly subulate from a long sheathing base; seta pale brown, erect, 2 to 2.5 cm long; capsule erect or nodding, cylindric, glossy, sulcate when dry, minutely strumose at base, urn 2 mm long; lid conic; peristome teeth reddish, from a short basal membrane, cleft almost to base into 2 filiform, minutely papillose forks narrowly bordered by the broader plates of the inner surface; annulus broad; spores pale, smooth, 10 µ in diameter.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merritt & Zschokke 16408, 16422;* Pauai to Baguio, *Merrill 4917;* Mount Santo Tomas, *Clemens 51913, Williams 1818:* Bontoc Subprovince, *Vanoverbergh 1312.*

Distribution: Europe, Mexico, South America, Africa, Asia.

A cosmopolitan subtropical species which, in some of its forms, is uncomfortably close to the ubiquitous *C. purpureus* Brid.

4. Family DICRANACEÆ

Small to robust plants. Stems usually branched. Leaves lanceolate, often slenderly acuminate, erect, secund or crispate. Costa single, usually extending to or beyond leaf apex. Basal cells rectangular, alar group often strongly differentiated; upper cells small, subquadrate, rarely elongate. Seta usually elongate, straight or cygneous; capsule ovoid or cylindrical, erect or curved, smooth or furrowed, sometimes strumose; peristome single, composed of 16 reddish teeth, cleft to about middle into 2 or 3 lanceolate-subulate forks, often vertically and obliquely striolate below on outer surface, papillose at tips; lid conic-rostrate.

Key to the genera of the Dicranaceæ.

1. Capsule neck slender, spongy, longer than urn.............. 6. *Trematodon.*
Capsule neck indistinct, shorter than urn.. 2.
2. Alar cells strongly differentiated.. 3.
Alar cells not or scarcely differentiated.. 10.
3. Costa broad, occupying ⅓ or more of leaf base.. 4.
Costa narrow, occupying less than ⅓ of leaf base.. 6.
4. Interior cells of costa chlorophyllose, seta erect.............. 13. *Brothera.*
Interior cells of costa not chlorophyllose, seta cygneous.. 5.
5. Upper lamina cells linear.. 12. *Dicranodontium.*
Upper lamina cells oval or rhomboidal.. 11. *Campylopus.*
6. Leaves bordered with linear, hyaline cells.. 7.
Leaves not bordered.. 8.
7. Lamina cells smooth.. 18. *Dicranoloma.*
Lamina cells papillose.. 19. *Leucoloma.*
8. Peristome none.. 20. *Braunfelsia.*
Peristome present.. 9.
9. Leaves entire, peristome teeth papillose.. 17. *Holomitrium.*
Leaves toothed, peristome teeth striolate.. 18. *Dicranoloma.*
10. Peristome teeth divided to base into 2 filiform forks....... 7. *Wilsoniella.*
Peristome teeth entire or cleft only part way down.. 11.
11. Leaf cells papillose, seta very short.. 12.
Leaf cells smooth, seta elongate.. 13.
12. Leaves crispate, peristome none.. 14. *Amphidium.*
Leaves erect, peristome present.. 15. *Rhabdoweisella.*
13. Leaves minute, closely appressed, with secund tips.... 8. *Aongstroemia.*
Leaves larger, not appressed.. 14.
14. Seta stout, cygneous when moist.. 10. *Campylopodium.*
Seta slender, erect.. 15.
15. Robust plants, leaves strongly contorted when dry.... 16. *Symblepharis.*
Small plants, leaves not contorted when dry.. 9. *Dicranella.*

6. Genus TREMATODON Michx.

Trematodon MICHX., Fl. Bor. Am. 2 (1803) 289.

Small, gregarious plants, growing in patches. Stems short. Leaves rather abruptly narrowed from an ovate, concave base to a slender, flexuose point; costa ending in or just below bluntish, toothed apex; leaf cells smooth, short-rectangular above, more elongate toward base. Seta elongate, slender, flexuose; capsule curved, abruptly contracted to a long, slender, spongy neck, often strumose at base; peristome single, teeth irregularly perforate, papillose on edges, inner surface, and toward tips, vertically striolate on outer surface below; spores medium-sized.

TREMATODON LONGICOLLIS Michx. Plate 2, fig. 26.

Trematodon longicollis MICHX., Fl. Bor. Am. 2 (1803) 289.

Autoicous; small, densely gregarious, stramineous plants growing on earth, banks, or rocks. Stems 2 to 3 mm high.

Leaves erect-spreading, flexuose, 2.5 to 3.5 mm long, from a short, ovate, concave base narrowed to a linear channelled point, blunt at apex; margins crenulate in upper half, entire below, narrowly reflexed here and there; costa about 60 μ wide below, ending just under toothed apex; basal cells narrowly rectangular or linear, rather lax, up to 12 μ wide, upper cells rectangular, about 5 μ wide and 2 to 3 times as long. Seta yellowish, variable in length, up to 2 to 3 cm long, flexuose; capsule nodding or horizontal, urn 2 mm long, oblong-cylindric, brown, abruptly contracted to a pale, slender, spongy neck two or more times as long as urn, tapering to seta and often strumose at base; peristome teeth reddish, from a low basal membrane, irregularly perforate nearly to base, coarsely vertically striolate; annulus broad; lid conic-rostrate, shorter than urn; calyptra cucullate, entire at base; spores opaque, papillose, 18 to 20 μ in diameter.

LUZON, frequent in the mountain regions. MINDORO, Mount Abangan, *Merritt 8814*.

Distribution: Eastern United States, Mexico, Cuba, Italy, Ceylon.

I have not lightly assumed the responsibility for including all the Philippine collections under this typical North American species. An intensive study of the series in the Bureau of Science herbarium, referred by various authorities to *T. acutus* C. M., *T. capillipes* C. M., *T. drepanellus* Besch., and *T. paucifolius* C. M., led me to the conclusion that they were all forms of one specific type which I tentatively referred to *T. acutus* C. M. Further comparison with the familiar *T. longicollis* failed to develop any constant differences of more than relative value, so I am logically forced to conclude that the Philippine plants are inseparable from *T. longicollis* Michx.

The sporophyte characters, as broadly interpreted, are very variable, and the extremes often occur side by side in the same tuft. Setæ 1 to 3 cm high; capsule urn 2 to 3 mm long; neck, exclusive of urn, 5 to 8 mm long, either with or without a well-developed struma, spores 16 to 24 μ in diameter.

Musc. Frond. Archip. Ind. no. 258 from Ceylon, under the name of *T. longicollis* Rich. (Syn.: *T. ceylonensis* C. M.) indicates that Fleischer recognized the broader range of this species.

As far as the description of *T. drepanellus* Besch. is concerned, there is nothing to separate it from *T. longicollis*, except the relatively longer, strumose neck. Since the goiter or struma at the base of the neck is not always evenly developed, even in capsules of the same apparent age, I am very doubtful if this can be construed as a major character. As the capsules of *T. longicollis* frequently show the neck up to 7 to 8 mm long and much more than twice the length of the urn, I fail to see anything more in *T. drepanellus* than a form of *T. longicollis*, which intergrades freely with the type.

It would be unfair for me to reduce *T. acutus*, *T. capillipes*, and *T. paucifolius* to synonymy without seeing the types, but I feel confident that they will not prove to be specifically distinct from *T. longicollis*.

7. Genus WILSONIELLA C. M.

Wilsoniella C. M., Bot. Centralbl. (1881) 345.

Autoicous; rather flaccid, pale-green plants growing in lax or dense colonies. Stems erect, lightly radiculose below. Leaves laxly and widely spreading, slightly twisted when dry, narrowly ligulate lanceolate, blunt or acute at apex; costa slender, ending below apex, cells linear-rhomboidal, lax, smooth. Seta erect, elongate, pale yellow; capsule erect, cylindric; lid subulate-rostrate from a conic base; peristome teeth from a low basal membrane divided to base into 2 filiform, papillose forks; spores medium-sized.

1. **WILSONIELLA PELLUCIDA** (Wils.) C. M. Plate 2, fig. 27.

Wilsoniella pellucida (Wils.) C. M., Bot. Centralbl. 37 (1881) 345.
Trichostomum pellucidum Wils., Kew Journ. Bot. 9 (1857) 321.
Wilsoniella squarrosa Broth., Philip. Journ. Sci. 8 C B (1913) 65.

Autoicous; slender, flaccid, yellowish-green plants. Stems up to 1.5 cm high. Leaves widely spreading or laxly squarrose, slightly twisted, ligulate-lanceolate, 3 to 3.5 mm long, apex usually bluntly rounded; margins plane or irregularly reflexed, toothed near apex, entire below; costa slender, ending below apex; cells smooth, elongate, linear or narrowly rhomboidal. Seta slender, stramineous, 10 to 12 mm long; capsule erect, urn cylindric, pale brown, 1.5 mm long, contracted to a short neck; peristome single, reddish, teeth from a low basal membrane cleft to base into 2 filiform, papillose, spirally striolate forks; lid conic-rostrate with a fine oblique beak; calyptra cucullate, extending halfway down urn; spores dark brown, opaque, minutely papillose, 16 to 20 μ in diameter.

LUZON, Rizal Province, Antipolo, Hinulugan Taktak (waterfall), *Bartlett 15259* in part, *15260* in part, *15277* in part;

Ifugao Subprovince, *McGregor 20049;* Benguet Subprovince, Benguet Road, Twin Peaks, *Williams 2070:* Laguna Province, Calauan, *McGregor 19512;* Los Baños, *Baker 21529.*

Distribution: Ceylon, Java.

As the leaves are not uniformly squarrose in these collections, or, in fact, even in plants from the same locality, I do not believe that *W. squarrosa* can be maintained as a distinct species, especially in the absence of any other distinguishing characters.

The leaves of the typical plants are occasionally acutely pointed, and the leaves of var. *acutifolia* are not infrequently blunt, so that the form with narrower, more uniformly acute leaves is, at best, worthy of no more than varietal rank.

1. WILSONIELLA PELLUCIDA (Wils.) C. M. var. **ACUTIFOLIA** (Broth.) Dix.

Wilsoniella pellucida (Wils.) C. M. var. *acutifolia* (Broth.) Dix., Linn. Soc. Journ. Bot. (333) 1 (1935) 67.

Wilsoniella acutifolia Broth. nomen nudum, Philip. Journ. Sci. 31 (1926) 277.

Leaves slightly narrower and more uniformly acute.

Luzon, Ilocos Norte Province, *Ramos 33293;* Tayabas Province, Atimonan, *Merrill 3992;* Mount Binuang, *Ramos & Edaño 28940.*

Distribution: Borneo.

8. Genus AONGSTROEMIA Bry. Eur.

Aongstroemia Bry. Eur., Fasc. 33/36 (1846).

Dioicous; yellowish-green, scarcely glossy plants with slender, erect, julaceous stems, usually growing in dense tufts. Leaves small, appressed, with secund tips, broadly ovate, blunt; margins plane, erose-denticulate above; costa stout, ending below apex; cells rhomboidal, incrassate, smooth. Seta erect; capsule erect, ovoid; peristome none.

AONGSTROEMIA ORIENTALIS Mitt. Plate 2, fig. 11.

Aongstroemia orientalis Mitt., Trans. Linn. Soc. 2 (1891) 154.

Anomobryum uncinifolium Broth., Philip. Journ. Sci. § C 5 (1910) 146.

Slender, yellowish-green plants growing in rather dense tufts or mats. Stems erect, julaceous, usually simple. Leaves minute, appressed, with neatly secund points, broadly ovate, obtuse, 0.5 mm long, 0.3 mm wide; margins plane, erose-denticulate nearly to base; costa yellowish, 35 to 40 μ wide below, ending just below apex; leaf cells smooth, incrassate, oval-rhomboidal above becoming subrectangular toward base, about 5 μ wide, and up to 2 to 3 times that long, often linear in median portion near costa. Perichætial leaves erect from a sheathing base, acuminate, 1 mm long; seta erect, yellow, 8 to 10 mm long; capsule ovoid-cylindric, erect, arn reddish brown, 1 to 1.5 mm long; peristome none; annulus broad; lid conic-rostrate, oblique; spores pale, minutely papillose, 10 to 15 μ.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merritt, & Zschokke 16417.*

Distribution: Mexico, Himalayas, Burma, Yunnan.

An attractive little plant readily recognized by the slender, julaceous stems with the tips of the minute leaves neatly turned to one side. The sporophyte characters are described from a Mexican specimen, as fruiting plants have not yet been found in the Philippines.

9. Genus DICRANELLA Schimp.

Dicranella SCHIMP., Coroll. Bry. Eur. (1855) 13.

Dioicous; small plants in rather dense tufts or mats. Stems erect, usually radiculose below. Leaves abruptly narrowed from an ovate, concave base to a linear or subulate point; cells smooth, often incrassate, narrowly rectangular below, subquadrate or elongate above, alar group not differentiated; costa percurrent or excurrent. Seta slender, erect, flexuose; capsule erect or nodding; peristome single, the 16 reddish teeth papillose or striolate on outer surface, usually cleft to about middle into 2 pale, papillose forks; lid conic-rostrate, oblique; calyptra cucullate; spores medium-sized.

Key to the species of Dicranella.

1. Robust plants, capsules inclined, asymmetrical.................. 5. *D. setifera.*
  Small plants, capsules erect, symmetrical.................................. 2.
2. Capsules subglobose .... 3. *D. brasiliensis.*
  Capsules cylindric .... 3.
3. Peristome teeth entire .... 4. *D. insularis.*
  Peristome teeth cleft above .... 4.
4. Leaves abruptly subulate from a broad base.................. 1. *D. coarctata.*
  Leaves gradually tapering, linear-lanceolate.................. 2. *D. Leibergii.*

1. DICRANELLA COARCTATA (C. M.) Bryol. Jav. Plate 2, fig. 24.

Dicranella coarctata (C. M.), Bryol. Jav. 1 (1858) 84.
Aongstroemia coarctata C. M., Syn. 1 (1849) 431.

Slender, yellowish or golden-brown plants growing in dense tufts, slightly glossy. Stems erect, flexuose, 1 to 1.5 cm high, simple or branched. Leaves 3.5 to 4.5 mm long, crowded, erect-spreading, flexuose or falcate-secund, from a short slightly obovate base abruptly narrowed to a flexuose, subulate point; margins erect, entire; costa strong, about 100 µ wide below, slightly broader toward leaf shoulders, excurrent in a subulate point that is usually faintly toothed at the tip; upper leaf cells linear, indistinct, laxer and more narrowly rectangular in basal part, shorter toward margins and especially at leaf shoulders. Seta slender, erect, stramineous, flexuose, 10 to 15 mm long; capsule erect, brown, ovoid-cylindric, urn 1.5 mm long, faintly sulcate when dry; peristome teeth pale brown, 200 to 250 µ high, vertically striolate on outer surface, cleft about halfway down into 2 pale, papillose forks; annulus broad; lid oblique, slenderly conic-rostrate, up to 1.2 mm long; spores brownish, papillose, 20 to 22 µ in diameter.

LUZON, Bontoc Subprovince, *Vanoverbergh 548*; Mount Cana, *Ramos & Edaño 38232*: Ifugao Subprovince, Mount Polis, *McGregor 19940, 20314a*: Benguet Subprovince, Baguio, *Williams 1861*: Laguna Province, Mount Maquiling, *Baker 21091*.

Distribution: Ceylon, Pegu, Java, Formosa.

Well marked by the striolate peristome teeth and the leaves contracted at the shoulders to a subulate blade.

7. DICRANELLA LEIBERGII Williams. Plate 1, fig. 39.

Dicranella Leibergii WILLIAMS, Bull. Torr. Bot. Club 42 (1915) 571.

Rather flaccid, dull, pale-green plants, densely tufted. Stems erect, branched, up to 14 mm high. Leaves not crowded, laxly spreading and flexuose when dry, erect-spreading when moist, narrowly ovate-lanceolate, gradually acuminate, canaliculate, up to 3 mm long; margins narrowly reflexed, entire; costa slender, 45 µ wide below, percurrent or short excurrent, usually with a few minute teeth at tip; upper cells very long and narrow, about 7 µ wide and 10 to 12 times as long, with thin lateral walls, wider and laxer toward extreme base. Seta 6 to 8 mm long, slender, yellowish; capsule erect, pale brown, smooth, urn ovoid-cylindric, barely 1.5 mm long; peristome teeth pale brown, 70 to 80 µ high, papillose, not striolate, blunt and usually irregularly cleft above; lid oblique, conic-rostrate, 0.8 mm long; spores papillose, 16 to 20 µ.

POLILLO, *Leiberg 1260*.

Endemic.

As this species is known only from the original collection, further material is needed for a better understanding of its status and natural relationship.

3. **DICRANELLA BRASILIENSIS** (Duby) Bartram comb. nov. Plate 2, fig. 31.

Weisia brasiliensis DUBY, Mem. Soc. physiq. et hist. nat. Geneve 7 (1836) 412.

Didymodon pomiformis GRIFF., Not. 431; Ic. Pl. Asiat. 2 (1849) *pl.* 80, *fig.* 3.

Microdus brasiliensis (Duby) THER., Bull. Herb. Boiss. 7 (1907) 277.

Small, yellowish, densely tufted plants. Stems hardly 3 mm high. Leaves erect and slightly flexuose when dry, rigidly erect-spreading when moist, 1.5 to 2 mm long, ovate-lanceolate, gradually acuminate; margins erect, entire; costa percurrent or short-excurrent, usually with a few teeth at tip; upper cells narrowly rectangular or linear, incrassate, 5 μ wide and 3 to 5 times as long, laxer and more rectangular toward base. Seta erect, yellowish, 4 to 6 mm long; capsule short-ovoid to subglobose, pale brown, becoming darker with age; urn 0.6 to 1 mm long, smooth; peristome teeth short, blunt, about 50 μ high, papillose but not striolate on outer surface, irregularly cleft; annulus broad; lid conic-rostrate, oblique, about as long as urn; spores faintly papillose, 14 to 18 μ.

LUZON, Benguet Subprovince, Baguio, *Williams 1565*.

Distribution: Brazil, Himalayas, Java, Ceylon.

This species fruits abundantly, so that the short, ovoid capsules afford a good diagnostic character in relation to the other species.

4. **DICRANELLA INSULARIS** Williams. Plate 3, fig. 32.

Dicranella insularis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 332.

Similar to *D. brasiliensis* in appearance, but more silky due to the longer finely acuminate leaves. Leaves erect, flexuose to falcate-secund, 2 to 2.5 mm long, narrowly ovate-lanceolate, gradually subulate-acuminate; margins entire, slightly recurved; costa sharply defined below, 40 μ wide at base, short excurrent; upper cells very long and narrow, incrassate, 2 to 3 μ wide and 15 to 25 times as long, laxer and wider at base, several rows across leaf insertion irregularly rectangular and tinged with brown. Seta slender, up to 8 to 10 mm long; capsule ovoid-cylindric, brown, smooth, urn 1 mm long; peristome teeth short, up to 60 μ high, papillose on outer surface but not striolate, entire or slightly cleft above; lid conic-rostrate, up to 1 mm long; spores opaque, papillose, 15 to 18 μ in diameter.

LUZON, Benguet Subprovince, Baguio, *Bartlett 13581a* in part; Bataan Province, Lamao, *Williams 833* (type).

Endemic.

Quite distinct from *D. brasiliensis* in the longer, subcylindric capsules and the extremely long narrow upper leaf cells.

5. DICRANELLA SETIFERA (Mitt.) Jaeg. Plate 3, fig. 31.

Dicranella setifera (Mitt.) JAEG., Adumbr. 1 (1870–1871) 80.
Leptotrichum setiferum MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 11.

Relatively robust plants, yellowish green, closely tufted. Stems erect, up to 2 cm high, slightly radiculose below. Leaves 6 to 7 mm long, not crowded, from a short, erect, oblong-ovate, deeply concave, clasping base abruptly contracted to a long, flexuose, widely spreading point composed almost entirely of excurrent costa, faintly toothed at extreme tip; margins plane, entire; costa about 100 µ wide below, poorly defined, long excurrent; basal cells narrowly rectangular, shorter and laxer toward insertion, upper cells linear, incrassate. Seta erect, pale yellow, up to 2.3 cm long; capsule inclined, asymmetrical, sulcate, urn 1.5 mm long, strongly strumose; peristome teeth about 250 µ high, vertically striolate on outer surface, cleft about halfway down, forks subequal, papillose; annulus present; lid oblique, equalling urn; spores papillose, 18 to 20 µ.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 19998*.

Distribution: Sikkim, Assam, Sumatra, Java, Borneo.

A strongly marked species in the robust habit, the curved, sulcate and strumose capsules, and the widely spreading leaves.

10. Genus CAMPYLOPODIUM (C. M.) Besch.

Campylopodium (C. M.) BESCH., Ann. Sci. Bot. Nat. V 18 (1873) 189.
Aongstromia § *Campylopodium* C. M., Syn. 1 (1848) 423.

Small plants, similar in most structural details to *Dicranella* but differing markedly in the stout, curved or cygneous setae. Leaves from a short, clasping base abruptly linear-subulate; costa long-excurrent; cells smooth. Seta stout, strongly cygneous when moist; capsule ovoid, ribbed when dry; peristome teeth striolate, cleft about halfway down.

CAMPYLOPODIUM EUPHOROCLADUM (C. M.) Besch. Plate 3, fig. 31.

Campylopodium euphorocladum (C. M.) BESCH., Fl. Bryol. Nouvelle Calédonie V 18 (1873) 189.
Aongstromia euphoroclada C. M., Syn. 1 (1849) 429.

Dioicous; small, densely tufted plants, yellowish or fulvous, slightly glossy. Stems erect, simple or branched. Leaves from a short, erect, oblong base, abruptly narrowed to a long, slender, setaceous point composed principally of excurrent costa, flexuose when dry, more rigidly erect-spreading when moist, up to 4 mm long or longer; margins erect, minutely sinuate near leaf shoulders; costa strong, about 75 µ wide below, long-excurrent; basal cells narrowly rectangular with firm pellucid walls, shorter and irregular near leaf shoulders. Seta thick, brown, 5 to 10 mm long, flexuose when dry, strongly cygneous when moist; capsule ovoid, brown, sulcate when dry, often minutely strumose; peristome teeth reddish, vertically striolate, cleft about halfway down; lid shorter than urn; calyptra entire at base; spores papillose, 15 to 20 µ.

BATAN, *Fenix 3858*. LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1859*; Mount Data, *Ramos 5957* in part; Pauai, *Merrill 6675*; Baguio, *Robinson 14050*; Ifugao Subprovince, Mount Polis, *McGregor 19980*; Abra Province, Mount Posuey, *Ramos 27094*; Tayabas Province, Baler, *Santos 223, 232, 373, 374*; Nueva Vizcaya Province, Mount Umugan, *Ramos 8278*.

Distribution: East Africa, Malaysia, Pacific Islands to Hawaii.

An abundant fruiter and sharply distinguished from *Dicranella*, to which it is allied in vegetative characters, by the cygneous setæ.

11. Genus CAMPYLOPUS Brid.

Campylopus BRID., Musc. Recent. Suppl. 4 (1819) 71.

Dioicous; small or robust, densely tufted plants. Stems erect, radiculose or tomentose. Leaves crowded, erect-spreading, with slender, flexuose or secund points; costa broad below, occupying more than ⅓ of leaf base, percurrent or excurrent, often ridged or lamellose on back; basal cells narrow, frequently with pitted or sinuous lateral walls, alar cells usually hyaline or reddish and inflated, forming conspicuous auricles, upper cells rhomboidal. Seta arcuate or cygneous when moist; capsule small, ovoid, sulcate when dry; peristome teeth cleft to or below middle, striolate on outer surface; annulus large; lid conic-rostrate; calyptra usually cucullate and generally laciniate or fringed at base.

A large and difficult genus. The costal structure in cross section is an important diagnostic feature.

Key to the species of Campylopus.

1. Costa homogeneous in structure, without stereid cells (*Pseudocampylopus*) .... 2.
   Costa heterogeneous in structure, with stereids.......... 3.
2. Leaves abruptly aristate, marginal cells at base short.
   1. *C. acutirameus.*
   Leaves not aristate, marginal cells at base linear.... 2. *C. Pes Funaris.*
3. Costa with stereid cells only on dorsal side of median guide row (*Eucampylopus*) .... 4.
   Costa with stereid cells on both sides of median guide row (*Palinocraspis* and *Thysanomitrium*) .... 9.
4. Leaves without hyaline tips .... 5.
   Leaves with hyaline tips .... 7.
5. Capsules strumose, calyptra not fringed at base.......... 3. *C. caudatus.*
   Capsules not strumose, calyptra fimbriate .... 6.
6. Alar cells well differentiated .... 4. *C. ericoides.*
   Alar cells none or hardly differentiated.......... 5. *C. calodictyon.*
7. Small plants, alar cells not differentiated.......... 6. *C. subericoides.*
   Robust plants, alar cells well differentiated.......... 8.
8. Costa smooth on back.......... 7. *C. hemitrichius.*
   Costa ridged on back .... 8. *C. diversinervis.*
9. Leaves blunt or emarginate, with concolorous tips.... 12. *C. exasperatus.*
   Leaves acuminate or aristate, often with hyaline tips.......... 10.
10. Costa excurrent, in a long, denticulate, hair-point.... 10. *C. pereristatus.*
    Costa short excurrent, leaves not hair-pointed.......... 11.
11. Leaves long and slenderly acuminate, costa faintly ridged on back.
    9. *C. eurydictyon.*
    Leaves short-acuminate, costa lamellose on back....... 11. *C. umbellatus.*

1. CAMPYLOPUS ACUTIRAMEUS Dix. and Ther. Plate 3, fig. 31.

Campylopus acutirameus DIX. & THER., in herb.

Rather robust, densely tufted plants, yellowish green above, brown below, glossy. Stems up to 6 cm high, matted together, with radicles below, cuspidate at tips, often with minute, dwarf plantlets 1 to 2 mm high, attached by radicles to stems and branches. Leaves crowded, erect, and lightly spirally twisted when dry, erect-spreading when moist, oblong-lanceolate, abruptly aristate, deeply concave, 2.5 to 3 mm long; margins erect below, inflexed in upper two-thirds, serrulate toward apex; costa 180 to 200 μ wide, thin, about one third width of leaf base, excurrent in a stout yellowish, denticulate arista up to 0.5 mm long, with numerous low, serrate lamellæ on back above, in cross section essentially homogeneous in structure and without stereid cells; cells of leaf base subquadrate or short-rectangular, about 20 μ wide near costa, smaller toward margins, alar cells pale brown or hyaline, scarcely inflated and not sharply defined from adjacent basal cells; upper cells oval-rhomboidal, slightly incrassate. Fruit unknown.

LUZON, Laguna Province, Majayjay, *Baker 3659* (type); Tayabas Province, Lucban, *Pastrana 92*.

Endemic.

A unique species distinct from all of its local congeners in the cuspidate tips of the stems and branches and the bristle-tipped leaves. Both collections are recorded from roofs of houses.

2. CAMPYLOPUS PES FUNARIAE (C. M.) Par. Plate 4, fig. 36.

Campylopus Pes Funariæ (C. M.) PAR., Ind. Bryol. ed 1 (1894) 257.
Thysanomitrium pes Funariæ C. M., Linnaea 38 (1874) 551.

Pale yellowish-green plants, densely tufted. Stems elongate, tomentose. Leaves erect-spreading, comose, narrowly lanceolate, gradually long acuminate, up to 8 mm long, concave; margins erect, denticulate at extreme tip, entire below; costa thin, about 300 μ wide below, occupying more than half of leaf base, excurrent, smooth on back, in cross section showing a row of large cells on ventral surface and a dorsal band of nearly homogeneous cells without stereids; basal leaf cells rectangular, with thin, delicate walls, up to 20 to 24 μ wide near costa, linear and much elongated toward margins but not forming a distinct border, alar cells not differentiated, upper lamina cells narrowly rhomboidal with firm walls. Seta 10 to 12 mm long, erect and flexuose when dry, cygneous above when moist; calyptra fringed at base.

LUZON, Laguna Province, Majayjay, leg. *Wallis*.

Endemic.

This species is allied to *C. acutirameus* through the homogeneous structure of the costa, but differs widely in the shape of the leaves and the areolation of the leaf base. I have seen no subsequent collections that could be referred here.

3. CAMPYLOPUS CAUDATUS (C. M.) Mont. Plate 5, fig. 37.

Campylopus caudatus (C. M.) MONT., Bryol. Jav. 1 (1858) 78, pl. 65.
Dicranum caudatum C. M., Syn. 1 (1849) 401.

Slender, densely tufted plants, yellowish or pale brown. Stems up to 2 cm high, reddish tomentose throughout, usually simple. Leaves erect-spreading, with slender, flexuose or falcate-secund tips, comose, up to 7 mm long, from a short, concave base gradually narrowed to a long, channeled, setaceous point; margins erect, denticulate for a short distance below apex; costa

150 to 200 μ wide below, occupying about half leaf base, excurrent, denticulate on back above, in cross section showing a row of large empty cells on inner surface, a median guide row of similar cells and a band of small stereid and substereid cells on back; basal cells rectangular, with yellowish pellucid walls, 12 to 16 μ wide near costa, much narrower toward margins, alar cells hyaline or purplish, forming conspicuous auricles, upper lamina cells small, quadrate or rectangular, in vertical rows. Seta flexuose when dry, strongly cygneous when moist; capsule sulcate, distinctly strumose; calyptra entire at base or with a short fringe when young.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1856, 1858*: Pauai, *Merrill 4973*, "Haight's in the Oaks," *Mearns 4543*: Ifugao Subprovince, Mount Polis, *McGregor 20304*. MINDANAO, Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4789*.

Distribution: Himalayas, Ceylon, Sumatra, Java, Borneo, Moluccas.

For a comparison with *C. ericoides* refer to the note under that species.

4. CAMPYLOPUS ERICOIDES (Griff.) Jaeg. Plate 3, fig. 23.

Campylopus ericoides (Griff.) JAEG., Adumbr. 1 (1870–71) 128.
Dicranum ericoides GRIFF., Not. (1849) 420.

Closely resembling *C. caudatus* in size and appearance. Leaf margins sharply serrulate about one-third of the way down; alar cells slightly more inflated and paler, usually hyaline. Seta slightly tuberculate at tip; capsule not strumose; calyptra deeply fringed.

LUZON, Benguet Subprovince, Baguio, *Williams 1847*.

Distribution: Himalayas, Ceylon, Java.

Distinguished from *C. caudatus* principally by the deeply fringed calyptra and the estrumose capsules. The leaves of *C. ericoides* are more strongly toothed in the upper third and the alar cells are usually more inflated and paler, but apart from the sporophyte characters the distinctions are slight and not very obvious.

5. CAMPYLOPUS CALODICTYON Broth. Plate 4, fig. 24.

Campylopus calodictyon BROTH., Leafl. Philip. Bot. 2 (1909) 651.

Plants of medium size, yellowish green above, brown below. Stems erect, branched, 2 to 3 cm high, red tomentose above. Leaves rather crowded, upper in comose tufts on fertile stems, from an oblong, concave base quickly narrowed to a long, channeled, setaceous point, up to 7 mm long; margins erect, minutely denticulate about one third down; costa stout, about 300 μ wide below, occupying one-half of leaf base, excurrent, ridged on back above, in cross section showing a row of large empty cells on ventral face, a median guide row of similar cells, and a band of stereid cells on dorsal side with outer layer of cells differentiated; cells of leaf base rectangular with thin delicate walls, about 25 μ wide near costa becoming much narrower toward margins, alar cells scarcely differentiated, upper lamina cells small, narrowly rhomboidal, incrassate. Seta cygneous, strongly tuberculate at tip, smooth below; capsule asymmetrical, sulcate, tuberculate at base; calyptra deeply fringed.

NEGROS, Negros Oriental Province, Cuernos Mountains, Dumaguete, *Elmer 9745*.

Endemic.

Resembling *C. caudatus* and *C. ericoides* but separable by the scarcely differentiated alar cells and the more strongly tuberculate seta and capsule base.

6. CAMPYLOPUS SUBERICOIDES Williams. Plate 3, fig. 10.

Campylopus subericoides WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 330.

Slender plants, pale brown below. Stems erect, up to 3 cm high, usually with an innovation from just below comal tuft, pale tomentose above. Leaves erect, with flexuose, setaceous points, comose at tips of fertile stems, from a short oblong base quickly narrowed to a setaceous point, often hyaline at tip and serrulate about one-third of the way down, 4 to 5 mm long; costa excurrent in a short denticulate point, in cross section showing a row of large empty cells on ventral face, a median guide row of similar cells and a dorsal band of stereid cells; cells of leaf base rectangular with thin walls, up to 24 μ wide near costa, much narrower toward margins, without any differentiated alar cells, upper lamina cells small, narrowly rhomboidal. Seta erect and flexuose when dry, cygneous when moist; capsule asymmetrical, deeply sulcate; calyptra fringed at base.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1857*.

Endemic.

This species resembles *C. calodictyon* in the lack of differentiated alar cells, but the setae and base of the capsules are smooth.

The hyaline leaf tips are not conspicuous but in most of the leaves the tip is very fine and colorless.

7. CAMPYLOPUS HEMITRICHIUS (C. M.) Jaeg. Plate 3, fig. 41.

Campylopus hemitrichius (C. M.) Jaeg., Adumbr. 2 (1877–78) 648.
Dicranum hemitrichium C. M., Linnaea 4 (1874) 553.
Dicranum purpurascens C. M., Linnaea 4 (1874) 552.
Campylopus Foxworthyi Broth., Philip. Journ. Sci. § C 5 (1910) 139.
Campylopus Copelandii Broth., Leafl. Philip. Bot. 6 (1913) 1973.
Dicranodontium brachydictyon Broth., Philip. Journ. Sci. 31 (1926) 278.

Robust, golden-brown, glossy plants, densely tufted. Stems up to 10 cm long, usually branched, tomentose above. Leaves crowded toward ends of stems and branches, usually forming distinct comal tufts on fertile stems, more distant below, erect, with long, finely setaceous points, either concolorous or distinctly hyaline at tips, up to 12 mm long, from a narrow, oblong, slighty clasping base gradually narrowed to a very fine setaceous point, denticulate only at extreme apex; costa thin, up to 450 μ wide below, occupying about three quarters of leaf base, long-excurrent, in cross section showing a row of large empty cells on ventral face, a median guide row of much smaller cells, and a narrow band of stereid cells on dorsal side with outer layer of cells well differentiated; cells of leaf base narrowly rectangular, 10 to 15 μ wide near costa, gradually becoming linear and very narrow toward margins, alar cells hyaline or pale, fragile, forming distinct auricles; upper lamina cells minute, narrowly rhomboidal. Seta short, cygneous, not or hardly exceeding comal leaves; capsule brown, sulcate.

LUZON, Laguna Province, Mount Banahao, *Robinson 9339*, Copeland 830; Benguet Subprovince, Mount Santo Tomas, *Williams 1955*; Pauai, *Santos 32066*; Zambales Province, Mount Pinatubo, *Foxworthy 2549, 2551, 2552, 2554*; Mount Tapolao, *Ramos 5155*.

Distribution: Borneo.

A fine plant and rather variable in size and in the development of the hyaline leaf tips. These variations do not seem to be amenable to any satisfactory classification, and in the absence of any more marked diagnostic features I cannot help but feel that the forms are only minor variants of a single specific type. *D. brachydictyon* shows the typical *Eucampylopus* costal structure and is clearly a form of this species with concolorous leaf tips.

8. CAMPYLOPUS DIVERSINERVIS Broth. Plate 3, fig. 42.

Campylopus diversinervis BROTH., Philip. Journ. Sci. § C 5 (1910) 140.

Slender, rigid, densely tufted plants. Stems erect, simple, up to 5 cm high, reddish tomentose. Leaves rigidly erect-spreading, comose, rather distant below, 7 to 8 mm long, from an oblong-lanceolate, concave base gradually subulate-acuminate; margins erect below, inflexed above, serrulate toward apex; costa 450 μ wide below, occupying one half of leaf base, excurrent in a short, spiculose, more or less hyaline point, ridged on back, in cross section showing a median guide row of relatively small cells with a row of similar cells on ventral face and a narrow band of stereid cells on dorsal side; cells of leaf base hyaline, linear toward margins, gradually wider and rectangular near costa, alar cells pale brown, scarcely inflated and not auriculate, upper lamina cells obliquely oval-rhomboidal. Fruit unknown.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merritt & Zschokke 16407, 16423.*

Endemic.

This species is closely allied to the variable *C. introflexus*, but appears to be distinct in the ridged (not lamellose) costa, the short, inconspicuous hyaline leaf tips, and the different areolation of the leaf base.

9. CAMPYLOPUS EURYDICTYON Dix. Plate 3, fig. 43.

Campylopus eurydictyon DIX., in herb.

Caules ad 3 cm et ultra longi. Folia stricta, superne comosa, 5 mm longa, e basi oblonga anguste lineari-lanceolata, apice hyalino, minute denticulato; costa lata, dorso leniter sulcata; cellulae basilares magnae, rectangulares, hyalinae, alares hyalinae, haud vesiculosae, male definitae.

Slender, rather rigid, tufted plants. Stems up to 3 cm long or longer, tomentose below. Leaves erect, laxly appressed or slightly spreading, the upper comose, 5 mm long, from an oblong, slightly concave base narrowed to a slender, channeled, setaceous point, pale or hyaline at tips; margins entire or very faintly denticulate near apex; costa thin, about 300 μ wide below, faintly rigid on back, excurrent in a pale or hyaline minutely toothed tip, in cross section showing a narrow stereid band on dorsal side of median guide row and a row of large cells on ventral side intermixed with a few stereid cells near median portion; basal cells rectangular, hyaline, relatively numerous and large, 25 μ wide near costa, narrower toward margins, gradually smaller and chlorophyllose upward, alar cells pale or hyaline, not inflated or auriculate and hardly differentiated from adjacent cells of leaf base, upper lamina cells rhomboidal. Fruit unknown.

LUZON, Laguna Province, Mount Maquiling. *Herklots P 136*, (type), *Robinson 17075*; *Herklots 104*.

Endemic.

The large hyaline basal cells are conspicuous and extend well up the leaf, giving this species a distinctive appearance. As the costa shows a few distinct stereid cells on the ventral side of the guide row this species probably belongs in the section *Palinocraspis*, but the structure shows an interesting transition toward the *Eucampylopus* type.

14. **CAMPYLOPUS PERCRISTATUS** Ther. Plate 3, fig. 44.

Campylopus percristatus THER., Bull. Soc. Bot. Genève 20 (1936) 60.

Fairly robust, compactly tufted plants. Stems densely felted with reddish tomentum below, up to 3.5 cm high. Leaves erect, appressed, comose at ends of fertile stems, oblong-lanceolate, slightly contracted above auriculate base, long-aristate, pointed, slightly concave, 4.5 mm long including hair point, 0.9 mm wide; margins erect, denticulate at extreme apex; costa up to 300 µ wide, excurrent in a long concolorous or slightly hyaline, sharply denticulate bristlelike point, in cross section showing stereid bands on both sides of median guide row, with numerous high, serrate lamellæ on dorsal side; alar cells brown, vesiculose, extending nearly to costa, forming distinct auricles, supra-alar cells rectangular, pellucid, larger toward costa and smaller toward margins, upper lamina cells rhomboidal, with firm, pale walls. Setæ aggregate, 4 to 5 mm long, strongly cygneous, with capsules imbedded in comal leaves, scabrous at tips; capsule ovoid, sulcate, scabrous at base; peristome teeth pale, obliquely striolate, divided more than halfway down; calyptra short, fringed at base.

PHILIPPINES, without definite locality, *Cuming 2207*.

Endemic.

The bristle-tipped leaves will distinguish this plant from all local allies except *C. aeruginosus*, from which it differs widely in the costal structure and the auriculate alar cells. Its natural affinities are with *C. umbellatus*.

Doctor Merrill tells me that Cuming's cellular cryptogams were brought together and numbered as a block. The Sumatra, Malacca, and Saint Helena specimens were distributed under printed

"Philippine" labels, usually without localities. Under these circumstances this species, while probably Philippine, may possibly have come from the Malay Peninsula.

11. CAMPYLOPUS UMBELLATUS (W. Arn.) Bartram. Plate 3, fig. 45.

Campylopus umbellatus (W. Arn.) BARTRAM, B. P. Bishop Bull. 101 (1933) 44.
Thysanomitrium umbellatum W. ARN., Disp. (1826) 34.
Trichostomum Blumii DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 316.
Dicranum subexasperatum C. M., Linnæa 37 (1872) 169.

Variable plants in size and habit, usually growing in extensive tufts, often dark brown or black below, glossy. Stems up to 8 cm long or longer but usually shorter, laxly erect, branched or innovating from just below comal tufts, reddish tomentose below. Leaves rather crowded, erect-spreading, in comal tufts on fertile plants, oblong-lanceolate from a constricted, auriculate base, short-acuminate, up to 5 mm long, with or without hyaline points; margins plane or inflexed above, minutely denticulate toward point; costa up to 300 μ wide below, occupying ⅓ to ½ leaf base, excurrent, frequently but not always hyaline at tips, with variable serrate lamellæ on back above, in cross section showing stereid bands on both sides of median guide row; cells of leaf base rectangular, slightly incrassate, alar cells reddish brown, forming distinct inflated auricles, upper lamina cells obliquely oval and rhomboidal; comal leaves usually ending in longer, serrulate, hyaline hair points. Setæ aggregated, 5 to 6 mm long, cygneous when moist, slightly scabrous at tips; capsule about 1.5 mm long, sulcate, rough near base; peristome teeth striolate, cleft to or below middle into 2 pale, papillose forks; lid conic-rostrate; calyptra fringed at base.

LUZON, numerous collections from scattered localities. MINDORO, Mount Halcon, *Merrill 6111*. PALAWAN, Mount Manasal, *Edaño 80866*. NEGROS, Canlaon Volcano, *Merrill 6812*. MINDANAO, Lanao Province, Camp Keithley, *Clemens 45*; Davao Province, Todaya, Mount Apo, *Elmer 11509*; Camiguin de Mindanao, *Ramos 14898*; Bukidnon Province, Mount Lipia, *Ramos & Edaño 37168*.

Distribution: Wide and frequent through the islands of the Pacific and Indo-Malaya.

As far as I can see *Dicranum subexasperatum* is only one of the mutants of this plastic species without any constant or important distinguishing characters.

17. **CAMPYLOPUS EXASPERATUS** Brid. Plate 3, fig. 46.

Campylopus exasperatus Brid., Bryol. Univ. 1 (1826) 473.

Similar in habit and appearance to *C. umbellatus* and equally variable. Comal leaves of fertile stems concolorous, not hyaline-tipped, stem leaves closely appressed, emarginate or rounded, erose-denticulate at apex, near base of stem rigidly erect-spreading, tubulose above, blunt at apex; leaves of sterile stems similar to lower leaves of fertile plant, more appressed along frequent caudate tips; costa lightly ridged and serrulate on back but not lamellose, percurrent, upper lamina cells obliquely rhomboidal, narrower and often colorless toward margins, basal cells rectangular with pitted lateral walls, alar cells in spreading leaves brownish, forming a conspicuous group extending nearly to costa and slightly auriculate, alar cells in appressed leaves scarcely differentiated. Sporophyte similar to *C. umbellatus*, except for the calyptra which is entire or only slightly fringed at the base.

LUZON, Benguet Subprovince, Baguio, *Elmer 8796*; Pauai, *McGregor 8703*.

Distribution: Ceylon, Java, Celebes, Borneo, Hawaii.

This species is usually well defined by the concolorous leaf tips and the clasping median leaves of the fertile stems, notched and erose at the apex.

12. Genus DICRANODONTIUM Bry. Eur.

Dicranodontium Bry. Eur., Fasc. 41 (1847).

Dioicous; densely tufted, moderately robust, silky plants with tomentose stems. Leaves usually more or less falcate-secund, with long, finely setaceous points. Costa thin and broad below, in cross section showing stereid bands on both sides of median guide row, excurrent; alar cells hyaline or reddish, fragile, cells of leaf base rectangular, conspicuously larger and broader near costa, much narrower toward margins and upward. Seta curved or cygneous when moist; capsule symmetrical, ovoid-cylindric; peristome teeth divided nearly to base; calyptra not fringed.

Key to the species of Dicranodontium.

1. Leaves not auriculate at base.. 1. *D. nitidum.*
Leaves auriculate at base.. 2.
2. Small plants, inner basal cells not well differentiated.
3. *D. subasperum.*
Robust plants, up to 10 cm high, inner basal cells sharply differentiated.
2. *D. uncinatum.*

1. **DICRANODONTIUM NITIDUM** (Doz. & Molk.) Fleisch. Plate 3, fig. 47.

Dicranodontium nitidum (Doz. & Molk.) FLEISCH., Laubm. Java 1 (1900–1902) 87.
Campylopus nitidus DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1846) 139, *pl. 49.*

Densely matted, yellowish or golden-brown, glossy plants. Stems up to 3 cm long or longer, fragile, matted together with reddish tomentum below. Leaves crowded, flexuose and falcate-secund, about 6 mm long, from a short, ovate, concave base gradually narrowed to a channeled, finely setaceous point, minutely denticulate near apex; costa 150 to 200 μ wide below, long-excurrent and forming greater part of setaceous point, toothed at extreme tip; cells of leaf rectangular and pellucid near costa, about 15 μ wide, abruptly chlorophyllose and porose above, gradually much narrower and linear in 6 to 8 rows toward margins, alar cells very fragile, hyaline or reddish, not auriculate, upper lamina cells linear. Seta flexuose or curved when moist, 10 to 14 mm long, capsules cylindric, erect; peristome teeth divided to base.

MINDANAO, Bukidnon Province, Mount Lipa, *Ramos & Edaño 37165*; Tanculan, *Fenix 20197*.

Distribution: Java, Borneo, Celebes.

Distinguished from *D. uncinatum* principally by the absence of auricles at the leaf base.

2. **DICRANODONTIUM UNCINATUM** (Harv.) Jaeg. Plate 3, fig. 48.

Dicranodontium uncinatum (Harv.) JAEG., Adumbr. 2 (1877–78) 644.
Thysanomitrium uncinatum HARV., Hook. Ic. Pl. rar. (1837) *pl. 22, fig. 5.*

In deep, dense tufts. Stems elongate, up to 10 cm long or longer, branched, fragile. Leaves crowded, usually strongly falcate-secund, up to 12 mm long, from a relatively broad, auriculate, clasping base quickly narrowed to a long, channeled, setaceous point, minutely denticulate toward apex; costa strong, long-excurrent; basal cells rectangular, pellucid and up to 26 μ wide near costa, narrower and linear toward margins forming a border 8 to 10 rows wide, chlorophyllose above with porose lateral walls, alar cells auriculate, hyaline or reddish, very fragile, uppr lamina cells linear, incrassate. Sporophyte as in *D. nitidum*.

LUZON, Benguet Subprovince, Pauai, *McGregor 8690, Clemens 9319*; Mount Pulog, *Curran, Merritt & Zschokke 16399* in part; Laguna Province, Mount Banahao, *Robinson 6598*.

Distribution: India, Siam, Java, Moluccas.

Several specimens in the Philippine National Herbarium have been determined by Brotherus as *D. dicliegon* (Mitt.) Jaeg., but I cannot distinguish them from *D. uncinatum.*

DICRANODONTIUM UNCINATUM (Harv.) Jaeg. var. MERRILLII (Broth.) Bartram comb. nov.

Dicranodontium Merrillii Broth. in herb.

Folia arcte serrulata; cellulae basilares chlorophyllosae magis incrassatae et porosae.

Leaves sharply serrulate; chlorophyllose cells of leaf base strongly porose and thick-walled.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13299, Hadden 106;* Mount Panai, *Merrill 4900.*

A well-marked variant in the characters outlined above, but hardly worthy of anything more than subordinate rank.

4. DICRANODONTIUM SUBASPERUM Williams. Plate 4, fig. 43.

Dicranodontium subasperum WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 337.

Relatively small, densely tufted, glossy plants. Stems erect, branched, 2 to 2.5 cm high, tomentose, often with apical clusters of short, microphyllous branches. Leaves 5 to 6 mm long, from a short, oblong, concave base gradually narrowed to a subtubulose, flexuose, setaceous point; margins involute from just above base, minutely denticulate about one-third down; costa poorly defined, 150 to 175 µ wide below, excurrent; cells of leaf base rectangular, with incrassate, yellowish pellucid walls gradually becoming narrower and linear toward margins, near costa about 15 µ wide, alar cells hyaline or reddish, forming conspicuous inflated auricles, upper lamina cells linear, 10 to 12 times as long as wide. Seta 6 to 8 mm long, cygneous when moist; capsule ovoid-cylindric, 1.7 mm long; peristome teeth striolate, divided nearly to base; spores 10 µ in diameter.

LUZON, Mountain Province, Mount Santo Tomas, *Williams 1846.*

Endemic.

A smaller plant than the ordinary forms of *D. uncinatum,* with shorter leaves and lacking the well-defined group of large pellucid cells on each side of the costa in the leaf base.

14. Genus BROTHERA C. M.

Brothera C. M., Gen. Musc. (1901) 258.

Dioicous; small, slender, whitish plants, slightly glossy, scattered or in dense low mats. Stems short, radiculose below.

Leaves crowded, erect-spreading, subulate-acuminate from a small lanceolate base, subtubulose; costa broad, excurrent, without stereids; lamina cells rectangular, hyaline and fragile at basal angles, slightly auriculate. Seta erect, slender; capsule oblong-ovoid, erect; peristome single, divided to base into 2 subulate, papillose forks; lid erect, long-rostrate; calyptra cucullate, fringed at base.

BROTHERA LEANA (Sull.) C. M. Plate 1, fig. 54.

Brothera Leana (Sull.) C. M., Gen. Musc. (1901) 259.
Campylopus Leanus SULL., A. Gray Man. ed. 2 (1856) 619.

Small, pale-green or whitish plants. Stems short, branched up to 5 mm high, radiculose below, often with apical clusters of propagula. Leaves erect-spreading, lanceolate-subulate from a small, concave base, about 2.5 mm long, entire or with a few minute teeth at extreme apex; margins erect or incurved from just above base; costa 60 µ wide below, not sharply defined, occupying one-third of leaf base, long-excurrent, in cross section showing a median row of chlorophyllose cells with bands of lax, hyaline, empty cells on both sides; cells of leaf base rectangular, at basal angles hyaline, laxer and more delicate, forming small auricles. Fertile plants unknown so far in the Philippines.

LUZON, Benguet Subprovince, *Curran 15696a*; Baguio, *Bartlett 19337b*.

Distribution: North America, Japan, China, Manchuria, Himalayas.

The pale color and small, slender, subulate leaves with a relatively broad costa will serve to identify the species. The only local collections I have seen are associated with *Syrrhopodon Gardneri* on the bark of trees.

14. Genus AMPHIDIUM Nees

Amphidium NEES in Sturm, Deutchl. Fl. 2 Heft 17 (1819); *emend.* Schp., Bry. Eur. Coroll. (1856) 39.

Slender plants growing in dense tufts or cushions, olive-green above, brown below. Stems branched, matted together with brown radicles. Leaves strongly curled and contorted when dry, linear-lanceolate, canaliculate; costa strong, percurrent; upper cells rounded-quadrate, papillose, basal cells smooth, narrowly rectangular, incrassate, pellucid. Capsule erect on a short seta, ribbed; peristome none.

AMPHIDIUM PAPILLOSUM Bartram sp. nov. Plate 1, fig. 55.

Dense caespitosum, sordide viride, inferne fuscum. Caulis ramosus, 2 cm altus. Folia sicca arcte contorta, 3 to 4 mm longa, e basi concava, lineari-lanceolata; margine erecti, integri vel leviter sinuati; costa pervalida, dorso superne papillosa, subpercurrens; cellulae superiores rotundato-quadratae, papillosae, basilares rectangulares, pellucidae.

Densely tufted plants, dull olive-green above, brown below. Stems usually branched, abundantly radiculose, matted together nearly to tips. Leaves strongly curled when dry, 3 to 4 mm long, linear-lanceolate from a narrow, concave base; margins erect, entire or indistinctly sinuate above; costa strong, ending in or just below apex, 75 μ wide below, papillose on back about halfway down; upper cells rounded-quadrate, incrassate, strongly papillose, 8 to 10 μ in diameter, gradually more elongate below, lowermost cells near costa narrowly rectangular, smooth, with sinuose, incrassate, pellucid walls, shorter in several rows toward margins. Perichætial leaves not differentiated; archegonial bud terminal. Fruit unknown.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13275* (type); *Clemens 51907*.

Endemic.

Without fruit the true systematic position of this species must remain uncertain, but the vegetative characters agree perfectly with *Amphidium*. The broad nerve and the erect margins seem to preclude any form of *Hymenostylium recurvirostrum*. Except for the papillose costa the leaves are very similar to those of *A. cyathicarpum*.

15. Genus RHABDOWEISIELLA Williams

Rhabdoweisiella WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 333.

Small, gregarious plants. Leaves slightly contorted when dry, oblong-spathulate, obtuse; margins erect, crenulate above; costa ending below apex; upper cells quadrate-hexagonal, pellucid, mamillose, basal cells rectangular, smooth. Capsule exerted on a short, curved seta, ribbed when dry; peristome teeth 16, smooth, in 8 pairs; lid conic, blunt; calyptra cucullate, papillose.

RHABDOWEISIELLA PAPILLOSA Williams. Plate 4, fig. 42.

Rhabdoweisiella papillosa WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 334.

Minute plants. Stems 2 to 4 mm high, slightly radiculose at base. Leaves up to 1 mm long, erect-spreading when moist, oblong-spathulate, obtuse; margins plane, crenulate in upper half; costa stout, smooth, ending well below apex; areolation pellucid, upper cells quadrate-hexagonal, 12 to 16 μ, mamillose on both sides, basal cells smooth, rectangular. Perichætial leaves erect, loosely clasping, larger and more pointed than stem leaves; seta curved, 1.5 mm long; capsule oblong, suberect, urn 0.65 mm long, 8-ribbed when dry; annulus distinct; peristome teeth smooth, united in 8 pairs; lid convex, bluntly apiculate; calyptra cucullate, split nearly to apex, conspicuously papillose; spores rough, 20 to 24 μ.

LUZON, Benguet Subprovince, Baguio, *Williams 2131.*

Endemic.

The herbarium material is so scant that I have paraphrased Mr. William's detailed description rather than to make any further dissections. There should be no difficulty in recognizing such a unique species, and additional collections will be exceedingly welcome.

16. Genus SYMBLEPHARIS Mont.

Symblepharis MONT., Ann. Sci. Nat. II 8 (1837) 252.

Robust plants locally, growing in dense tufts. Stems usually branched, radiculose below. Leaves from a wide, erect, clasping base gradually narrowed to a long, slender, abruptly spreading, flexuose point; margins erect; costa narrow, excurrent; upper leaf cells rectangular, incrassate, basal cells linear with firm walls, alar cells not differentiated. Seta erect, terminal, becoming lateral by the innovating stem, often aggregated; capsule erect, ovoid-cylindric; peristome teeth papillose, irregularly cleft above.

SYMBLEPHARIS REINWARDTII (Doz. & Molk.) Bryol. Jav. Plate 4, fig. 55.

Symblepharis Reinwardtii (DOZ. & MOLK.) Bryol. Jav. 2 (1870) 226.
Dicranum Reinwardtii DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 303.

Relatively large, glossy plants, bright yellow above, brown below. Stems up to 8 cm high. Leaves crowded, up to 14 mm long, from an erect, clasping base, lanceolate-subulate, channeled above, abruptly and widely spreading from leaf shoulders; margins erect, denticulate for some distance below apex; costa distinct, 75 μ wide below, excurrent; cells of leaf base linear, with firm, sinuose, yellowish pellucid lateral walls, gradually shorter and narrowly rectangular upward, upper lamina cells 5 μ wide and 2 to 5 times as long, smooth. Seta terminal, erect, slender, about 6 mm long; capsule erect, brown; peristome teeth more or less paired, irregularly cleft nearly to base, reddish brown, papillose, often perforate, recurved when dry; annulus present; calyptra cucullate, entire at base; spores papillose, 30 to 34 μ.

LUZON, Laguna Province, Mount Banahao, *Robinson 6604*.

Distribution: Himalayas, Java, Burma, Borneo.

A fine plant with a characteristic shaggy appearance due to the crowded, widely spreading leaf points.

17. Genus HOLOMITRIUM Brid.

Holomitrium BRID., Bryol. Univ. 1 (1826) 220.

Densely tufted plants. Stems branched, tomentose. Leaves crispate when dry; lanceolate from an erect base; costa percurrent; basal cells linear, alar group well defined, upper cells rounded. Inner perichætial leaves setaceous from a long, convolute base, strongly differentiated from stem leaves; capsule erect, cylindric; peristome teeth 16, reddish brown, usually perforate along median line; lid conic-rostrate.

HOLOMITRIUM VAGINATUM (Hook.) Brid. Plate 4, fig. 54.

Holomitrium vaginatum (Hook.) BRID., Bryol. Univ. 1 (1826) 227.

Trichostomum vaginatum HOOK., Musc. Exot. 1 (1818) *pl. 64*.

Pseudoautoicous; dwarf male plants attached to tomentum of fertile stems. Tufts dense, pale brown or yellowish above, darker brown below. Stems about 1 cm long, densely foliate. Leaves with inrolled points when dry, widely spreading from an erect base when moist, 2 to 3 mm long, oblong-lanceolate from a short, oblong base, deeply carinate, short-acuminate; margins erect, essentially entire; costa percurrent or slightly excurrent; basal cells rectangular, incrassate, shorter toward margins, alar cells pale brown, subquadrate, merging on inner side with a group of delicate, hyaline cells extending to costa, upper cells rounded, 6 to 8 μ in diameter, smooth, incrassate. Perichætial leaves conspicuous, inner erect, about 5 mm long, subulate-acuminate from a long sheathing base; seta erect, 10 to 12 mm long; capsule erect, cylindric; peristome teeth deeply inserted, smooth, divided about halfway down.

LUZON, Bataan Province, Mount Mariveles, *Copeland "A."* MINDORO, Puerto Galera, *Bartlett 13863*.

Distribution: Java, New Caledonia, Tahiti.

The conspicuous perichætium is a well-marked feature of this plant. It appears to be uncommon locally but should be looked for on tree trunks and large branches in the mountain rain forests.

18. Genus DICRANOLOMA Ren.

Dicranoloma REN., Rev. Bryol. 28 (1901) 85.

Medium-sized to robust plants, densely tufted. Stems branched, tomentose. Leaves ovate-lanceolate, usually serrate in upper half, often falcate-secund; costa narrow, percurrent or excurrent, frequently with serrate lamellæ or wings on back; leaf cells smooth, irregularly rhomboidal or linear above, more elongate below, frequently hyaline and very narrow in several rows toward basal margins forming a distinct border, alar cells brownish, conspicuous. Seta erect, short or elongate, smooth, often aggregated; capsule cylindric, erect or arcuate; peristome teeth 16, reddish, striolate, cleft into 2 or 3 pale forks above middle; lid conic-rostrate; calyptra entire at base.

Key to the species of Dicranoloma.

1. Capsules arcuate .... 2.
Capsules erect .... 4.
2. Leaves coarsely spinose serrate .... 3. *D. perarmatum.*
Leaves serrulate .... 3.
3. Leaf base broad, upper cells rhomboidal .... 1. *D. assimile.*
Leaf base narrow, upper cells linear .... 2. *D. philippense.*
4. Seta 1 cm or over, stems with central strand .... 5.
Seta 5 mm or less, stems without central strand .... 8.
5. Leaves to 15 mm long, with long setaceous points .... 4. *D. Blumii.*
Leaves 7 mm or less long, without setaceous points .... 6.
6. Leaves not plicate, fragile .... 5. *D. fragile.*
Leaves strongly plicate, not fragile .... 7.
7. Leaf cells narrowly linear, incrassate, porose .... 6. *D. reflexifolium.*
Leaf cells broader and shorter, not incrassate .... 7. *D. reflexum.*
8. Golden brown plants, stems with filiform propagula .... 8. *D. Braunii.*
Pale-green plants, stems without propagula .... 9. *D. leucophyllum.*

1. DICRANOLOMA ASSIMILE (Hampe) Par. Plate 4, fig. 65.

Dicranoloma assimile (Hampe) PAR., Ind. Bryol. ed. 2 (1904) 24.
Dicranum assimile HAMPE, Ic. Musc. (1844) pl. *124.*

Robust, glossy, golden-brown plants. Stems to 8 cm long, branched, tomentose throughout. Leaves crowded, flexuose and falcate-secund, to 12 mm long, from a broad, ovate, deeply concave base gradually narrowed to a channeled linear-setaceous point slightly longer than basal portion; margins erect or inflexed, sharply serrulate about halfway down; costa narrow, distinct, percurrent or short-excurrent, with two serrate wings on back above; basal cells linear, porose, with firm walls, several rows at margins elongate and colorless, gradually shorter upward, upper lamina cells rhomboidal, irregular, 2 to 3 times as long as wide, alar cells in a large auriculate group extending about halfway to costa. Setæ aggregated; capsules arcuate.

MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 14404.*

Distribution: Java, Sumatra, Celebes, Borneo.

This species is represented locally by only one collection that I know of. As the plants are sterile the record is open to some question.

2. DICRANOLOMA PHILLIPSIAE Bartram sp. nov. Plate 4, fig. 56.

Species *D. assimili* affinis sed foliis multo angustioribus et cellulae superiores lineares, circa 1:10; seta solitaria.

Robust, densely tufted plants, pale green. Stems to 7 cm long, branched above, tomentose. Leaves crowded, slender, widely spreading, falcate-secund in comal tufts, about 10 mm long, from a narrow, lanceolate, subtubulose base gradually narrowed to a setaceous point; margins erect or inflexed, serrulate halfway down; costa narrow, thin and faint, toothed on back above; cells linear, strongly porose and incrassate, chlorophyllose, about 5 µ wide and 8 to 12 times as long, longer toward base and very narrow and hyaline in 4 or 5 rows at basal margins, alar cells deep brown, strongly auriculate. Perichætial leaves abruptly long subulate-acuminate from a broad convolute-sheathing base; seta solitary, red, to 2 cm long; capsule cylindrical, arcuate.

MINDANAO, Bukidnon Province, near Impalutao, *Mrs. L. H. Phillips no. 20.*

Endemic.

The narrow, setaceous pointed leaves lend a characteristic silky appearance to this species. It is obviously distinct from *D. assimile* and *D. perarmatum* in the narrow, subtubulose leaf base. The solitary seta and linear upper lamina cells are strong diagnostic characters distinguishing it from *D. assimile*, to which it seems to be most closely related.

Mrs. Phillips has generously coöperated in the collection of mosses from Mindanao, a region which contains untold possibilities, and I take pleasure in associating her name with this unique species.

3. DICRANOLOMA PERARMATUM Broth. Plate 4, fig. 57.

Dicranoloma perarmatum BROTH., Oefv. Finska Vet.-Soc. Foehr. (14) 47 (1904–1905) 1.

Dicranoloma monocarpum BROTH., Philip. Journ. Sci. § C 13 (1918) 202.

Densely tufted, brownish plants with branched, tomentose stems up to 6 cm high. Leaves crowded, widely spreading, often falcate-secund, up to 8 mm long, ovate-lanceolate, gradually acuminate, coarsely spinose-serrate on margins above; costa distinct, with two strongly toothed wings on back above: basal cells linear, porose, incrassate, very narrow and colorless in several rows toward margins, alar cells numerous, subquadrate, extending more than halfway to costa, upper lamina cells elongate, incrassate, 3 to 6 times as long as wide. Perichætial leaves setaceous-pointed, from a long, erect, convolute base; setæ aggregated, rarely solitary, 1.5 to 2 cm long; capsule cylindric, curved; lid long-beaked, about as long as urn; peristome teeth cleft to below middle; spores minutely papillose, 10 to 12 μ.

LUZON, Bataan Province, Lamao River, *Williams 841*: Camarines Province, Mount Isarog, *Ramos 22114*. MINDANAO, Davao Province, Mount Apo, *Elmer 11478*, *Copeland 1126* (type), *Williams 2655*.

Endemic.

Somewhat smaller than *D. assimile* and distinguished from it by the shorter leaves and more coarsely toothed upper margins. *D. monocarpum* Broth. is certainly only a diminutive form of this species with solitary seta.

6. **DICRANOLOMA BLUMII** (Nees) Par. Plate 3, fig. 56.

Dicranoloma Blumii (Nees) PAR., Ind. Bryol. ed. 2 2 (1904) 25.
Dicranum Blumii NEES, Nov. Act. Leop. (1) 11: 131, *pl. 15*.

Glossy, pale-brown plants with elongate, flexuose, branched stems up to 10 cm long or longer. Leaves widely spreading, falcate-secund above, up to 15 mm long, from a rather small, deeply concave, ovate base gradually narrowed to a long, finely setaceous point denticulate for a short distance below apex; costa very slender, well defined, excurrent; leaf cells linear, porose, incrassate, very long and narrow toward basal margins, alar cells a rich brown, in a triangular group extending more than halfway to costa. Seta solitary or aggregated, erect, 1 cm long or longer, soon becoming lateral by innovating stem; capsule erect, cylindric, pale brown.

LUZON, Laguna Province, Mount Banahao, *Merrill 7520*, *Copeland 823*, *McGregor 47451*, *Simbajon 3*: Bataan Province, Mount Mariveles, *Merrill 8557*: Zambales Province, *Curran and Merrill 8171*; Mount Tapulao, *Ramos 5147*: Tayabas Province, Infanta, *Robinson 9408*: Camarines Sur Province, Mount Isarog, *Edaño 84292*: Abra Province, Lepanto, *Micholitz*. NEGROS, Cuerno de Negros, *Magdumo 104*. MINDANAO, Davao Province, Mount Batangan, *Warburg*: Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 14106*.

Distribution: Ceylon, Sumatra, Java, Celebes, Borneo.

Distinguished from *D. Braunii* by the finely setaceous leaf points and the lack of propagula in the upper leaf axils.

5. DICRANOLOMA FRAGILE (Hook.) Broth. Plate 1, fig. 59.

Dicranoloma fragile (Hook.) BROTH., E. & P. Pflanzenf. ed. 2 10 (1924) 200.

Dicranum fragile HOOK., Musc. Exot. 2 (1820) pl. 135.

Relatively small plants with branched stems up to 2 to 3 cm high, growing in compact mats or tufts, bright lustrous green above, brown below. Leaves crowded, lightly falcate, very brittle, points of all but comal leaves usually broken off, 4 to 6 mm long, ovate-lanceolate, gradually acuminate, carinate-concave; margins erect, sharply serrate about halfway down; costa strong, poorly defined, toothed on back above, percurrent or ending just below apex; basal cells elongate, narrowly rectangular, chlorophyllose and filled with oil globules, thin-walled, alar cells subquadrate, hyaline or pale brown, not auriculate, extending about halfway to costa, upper cells rectangular with thin, hyaline walls, marginal row elongate and usually linear.

LUZON, Benguet Subprovince, Mount Data, *Hadden 107*; near Baguio, *Williams 1852*, *Bartlett 13336*, *13340*, *13342*.

Distribution: Himalayas, Annam.

Well characterized by the short stems with crowded, fragile leaves quite generally broken off below the apex.

6. DICRANOLOMA REFLEXIFOLIUM (C. M.) Par. Plate 1, fig. 60.

Dicranoloma reflexifolium (C. M.) PAR., Ind. Bryol. ed. 2 2 (1904) 29.

Dicranum reflexifolium C. M., Syn. 1 (1849) 352.

Dicranoloma Ramosii BROTH., Philip. Journ. Sci. § C 5 (1910) 138.

Dioicous, medium-sized plants, golden brown above, darker below, densely tufted. Stems branched, tomentose, up to 4 cm long. Leaves crowded, widely spreading, curved or flexuose, slightly falcate toward tips of branches, plicate, from an ovate base gradually linear-lanceolate, sharply serrate on back of costa and margins toward apex, up to 8 mm long; costa well defined, percurrent; leaf cells narrowly linear, incrassate, pitted, laxer at extreme base, marginal rows narrower, alar cells brown or yellowish, in a triangular group extending halfway to costa. Perichætial leaves erect, convolute, abruptly setaceous-pointed; setæ 2 or 3 from one perichætium, erect, 1 to 1.5 cm long; capsule cylindric, erect.

LUZON, Benguet Subprovince, Mount Ugo, *Ramos 5867*.

Distribution: Sumatra, Java.

Brotherus distinguishes *D. Ramosii* from *D. reflexifolium* by the subsecund comal leaves and laxer basal areolation. As the comal leaves of *D. reflexifolium* are not infrequently secund, to some extent at least, and the difference in the basal cells is small, I am at a loss to see how the Philippine plants can be segregated with any satisfaction. *D. Ramosii* is erroneously listed in the Pflanzenfamilien[2] as *D. ramosum* Broth.

7. DICRANOLOMA REFLEXUM (C. M.) Broth. Plate 4, fig. 61.

Dicranoloma reflexum (C. M.) BROTH., Pflanzenf. ed. 2 10 (1924) 209.
Dicranum reflexum C. M., Syn. 1 (1849) 373.
Dicranoloma tenuirete BROTH., Philip. Journ. Sci. § C 13 (1918) 202.

Densely tufted plants, yellowish green, slightly glossy. Stems up to 4 cm long, densely tomentose. Leaves crowded, up to 7 mm long, falcate above, widely spreading and flexuose below, gradually lanceolate from an ovate base, plicate, strongly serrate on margins and back of costa in upper third; costa brownish, 100 μ wide below; leaf cells narrowly rectangular, with firm, pale walls, 5 to 7 μ wide and 2 to 5 times as long in upper part of leaf, longer and more porose below, very long and narrow in several rows at basal margins, alar cells as in *D. reflexifolium*. Fruit not known in the Philippines.

LUZON, Abra Province, Mount Posuey, *Ramos 27090*.

Distribution: Java, Timor, Flores, Celebes.

There seems to be no appreciable difference between *D. tenuirete* and *D. reflexum*. In fact the distinguishing features noted by Brotherus are exactly those by which *D. reflexum* is separated from *D. reflexifolium*.

8. DICRANOLOMA BRAUNII (C. M.) Par. Plate 4, fig. 62.

Dicranoloma Braunii (C. M.) PAR., Ind. Bryol. ed. 2 2 (1904) 25.
Dicranum Braunii C. M., Bryol. Jav. 1 (1858) 69, *pl. 57*.

Golden-brown, glossy plants, with elongate, simple or branched stems up to 10 cm long, generally with clusters of filiform, septate propagula in axils of upper leaves. Leaves widely spreading, flexuose, falcate above, up to 1 cm long, ovate-lanceolate, gradually narrowed to a sharp but not setaceous point, coarsely serrate on margins and back of costa toward apex, costa percurrent or short-excurrent; leaf cells linear, porose, incrassate, laxer toward insertion and narrower at margins, alar cells numerous, extending nearly to costa. Setæ short, 3 to 4 mm long, aggregated; capsule erect, reddish brown, urn 2 mm long; lid conic-rostrate, shorter than urn.

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[2] P. 209.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 3184*: Pauai, *Santos 32062*; Baguio, *Elmer 8542*: Ifugao Subprovince, Mount Polis, *McGregor 20313*: Bontoc Subprovince, *Vanoverbergh 524*: Tayabas Province, Baler, *Santos 302*: Laguna Province, Mount Maquiling, *Baker 21896*, *2751*, *Hadden 100*. MINDORO, Puerto Galera, *Bartlett 13566*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 44*. MINDANAO, Mount Apo, *Williams 2655*: Lanao Province, Palao Amopo, *Bartlett 15240*, *15934*.

Distribution: Sumatra, Java, Celebes, Mollucas, New Guinea, New Caledonia, Ancityum, Samoa, Tahiti.

In fruit this species is distinguished from *D. Blumii* by the short setæ. Sterile plants may usually be separated by the shorter pointed leaves and the axillary propagula which are usually if not consistently present.

Smaller, more laxly leaved forms have been separated as forma *mindanense*, but the distinctions are slight and of doubtful value.

3. **DICRANOLOMA LEUCOPHYLLUM** (Hampe) Par. Plate 5, fig. 43.

Dicranoloma leucophyllum (Hampe) PAR., Ind. Bryol. ed. 2 2 (1904) 27.

Dicranum leucophyllum HAMPE, Sp. Nov. Musc. Archip. Ind. (1872) 10, *pl. 6B*.

Robust, pallid-green, glossy plants. Stems up to 10 cm long, usually branched, pale tomentose. Leaves crowded, falcate-secund above, horizontally spreading below, up to 15 mm long, from an ovate, deeply concave base gradually narrowed to a long, setaceous, channeled point, sharply serrulate at least halfway down; costa long-excurrent, toothed on back above; leaf cells linear, incrassate, more or less porose, especially below, very narrow and colorless in several rows at basal margins, alar cells numerous, usually hyaline, in a large group extending nearly to costa. Setæ aggregated, short, erect, about 6 mm long, soon becoming lateral by innovating stem; capsules erect, reddish brown, urn 2 to 2.3 mm long; lid conic-rostrate, oblique, shorter than urn.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13266*, *Hadden 108*, *Williams 1853*: Pauai, *Santos 32056*, *McGregor 8694*, *Copeland 1844*; Suyoc to Pauai, *Merrill 4942*: "Haight's in the Oaks," *Mearns 4544*: Cagayan Province, Mount

Dos Cuernos, *Ramos 34365, 34374.* MINDORO, Puerto Galera, *Bartlett 13862.* NEGROS, Oriental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 10056.* MINDANAO, Mount Apo, *Williams 2654.*

19. Genus LEUCOLOMA Brid.

Leucoloma Brid., Bryol. Univ. 2 (1827) 218.

Dioicous; medium-sized plants growing in lax to rather dense tufts. Stems usually branched, not or scarcely radiculose. Leaves crowded, flexuose or curved, ovate-lanceolate with long setaceous points; costa narrow, excurrent; chlorophyllose leaf cells small, papillose, marginal cells smooth, narrow and hyaline, forming a more or less distinct border, alar cells in a large, auriculate group. Seta erect; capsule cylindric; peristome teeth cleft to or below middle.

Key to the species of Leucoloma.

Stems 5 to 6 cm long, leaves with a sharply defined median band of small, papillose cells extending to base .... 1. *L. molle.*
Stems about 1 cm long, leaves without a well-defined median band of small cells .... 2. *L. perviride.*

1. LEUCOLOMA MOLLE (C. M.) Mitt. Plate 5, fig. 14.

Leucoloma molle (C. M.) MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 13.
Dicranum molle C. M., Syn. 1 (1849) 354.

Slender, pale-green, glossy plants. Stems elongate, wiry, branched, up to 5 cm high, often naked below. Upper leaves crowded, falcate-secund, up to 5 mm long, from an ovate, concave base gradually narrowed to a grooved, finely subulate point, minutely denticulate near apex; costa narrow, pale, excurrent; chlorophyllose leaf cells small, oval-oblong, papillose in a broad median band extending to insertion, more elongate and essentially smooth near extreme base, bordered on both margins by bands of linear, hyaline cells decreasing in width upward and continuous to top of lamina, alar cells oblong, incrassate, hyaline or pale brown, in a conspicuous, auriculate group extending nearly to costa. Seta short, erect; capsule erect, ovoid; peristome teeth cleft nearly to base. Fruit rare.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13313*; Baguio, *Baker 3849*; Laguna Province, Mount Maquiling, *Robinson 17044, Bartlett 15775*; Pampanga Province, Camp Stotsenburg, *Elmer 22106a.* MINDORO, Puerto Galera, *Bartlett 13466, 13630.* PALAWAN, Mount Balagbag, *Edaño 39906*; Mount

Mantalingahan, *Edaño 60346*. MINDANAO, Lanao Province, Pulao Amopo, *Bartlett 15242a*, *15945*, *15950a*, *15953*.

Distribution: Wide in Malaysia and the Pacific islands to Hawaii, China, and Japan.

Under the microscope the unique areolation of the leaf blade will identify this species at a glance. It is very distinct from *L. perviride* in the elongate wiry stems and the well-defined, continuous, pale leaf border.

7. LEUCOLOMA PERVIRIDE Broth. Plate 3, fig. 65.

Leucoloma perviride BROTH., Philip. Journ. Sci. § C 5 (1910) 139.

Relatively small, densely tufted plants, yellowish green above, brown below, slightly glossy. Stems up to 1.5 cm high, branched, slightly radiculose at base. Leaves crowded, falcate-secund, about 3 mm long, from an oblong base gradually narrowed to a linear, subulate, grooved point slightly longer than basal portion; margins erect, minutely denticulate toward apex; costa narrow, pale, ending in acumen; chlorophyllose leaf cells quadrate or rectangular, more or less rounded, incrassate, minutely papillose above, nearly smooth near insertion, occupying entire subula and bordered in basal portion by a narrow, indistinct marginal band of elongated, hyaline cells, alar cells oblong, forming conspicuous auricles extending nearly to costa. Sporophyte unknown.

LUZON, Bataan Province, Mount Mariveles, *Merrill 6251* (type); Upper Lamao River, *Williams 838*: Nueva Ecija Province, Bongabong, *Santos 104*: Zambales Province, Olongapo, *Ebalo 32*; Mount Marayep, *Ramos & Edaño 44818*, *44812c*. CULION, Calamian Group, between Culion and "Negative Barrio," *Bartlett 15553*.

Endemic.

A distinct species in the short stems and crowded, indistinctly bordered leaves.

20. Genus BRAUNFELSIA Par.

Braunfelsia PAR., Ind. Bryol. (1894) 148.

Generally robust plants growing in dense tufts. Stems sparingly radiculose below, usually branched. Leaves crowded, falcate secund or spreading in all directions, concave, from a broadly ovate base rapidly narrowed to a slender, grooved, subulate point, subentire; costa single or none; cells narrowly linear, porose, incrassate, alar cells numerous, subquadrate, brown, in a well-defined group. Perichætial leaves very conspicuous, closely convolute with long, flexuose setaceous points, the inner exceeding capsule; capsule cylindric, erect; peristome none; annulus none; calyptra cucullate.

BRAUNFELSIA DICRANOIDES (Doz. & Molk.) Broth. Plate 5, fig. 46.

Braunfelsia dicranoides (Doz. & Molk.) BROTH., E. & P. Pflanzenf. ed. 1 Musci (1901) 321.
zenf. ed. 1 Musci (1901) 321.
Holomitrium dicranoides DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1854) 9, pl. 4.

Robust, golden-green, glossy plants. Stems up to 10 cm high or higher, branched. Leaves falcate-secund, about 6 mm long, from a broad, ovate, concave base quickly narrowed to a grooved, subulate point about as long as basal portion, entire or with a few blunt teeth at tip; costa slender, distinct, percurrent, occasionally wanting; cells linear, porose, incrassate, very long and narrow toward basal margins, alar cells in a conspicuous, oblong group. Perichætial leaves erect, convolute, forming a high cylinder extending more than halfway up the seta, points of inner leaves exceeding capsules; seta slender, about 1 cm long; capsule erect, cylindric, 3 mm long; peristome none.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13287, 13286, 13284, 13292*; Bontoc Subprovince, *Vanoverbergh 1881*; Camarines Sur Province, Mount Isarog, *Edaño 84217, 84227, 84232, 84213*. MINDORO, Puerto Galera, *Bartlett 13508*. PALAWAN, Mount Manalsal, *Edaño 80864, 80865, 80867*; Mount Gantung, *Edaño 80881*. MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11600*.

Distribution: Java, Malay Peninsula.

This fine species fruits freely and may be recognized by the conspicuous cylindrical perichætium and the gymnostomous capsules. The leaves are generally falcate-secund and show a slender, sharply defined costa extending well into the acumen; unfortunately, as these characters are not consistently maintained, it seems unwise to specifically segregate the plants described as *B. luzonensis* Broth. There is not a single important character that is not shared by both plants. One frequently finds leaves with no trace of a costa on typical stems of *B. dicranoides*, and conversely some leaves of *B. luzonensis* invariably show a faint but distinct costa. Both forms show the leaves either falcate-secund or spreading on all sides, but the typical plant with costate leaves is more apt to have the leaves consistently curved to one side.

BRAUNFELSIA DICRANOIDES (Doz. & Molk.) Broth. var. **LUZONENSIS** (Broth.) Bartram comb. nov.

Braunfelsia luzonensis BROTH., Philip. Journ. Sci. § C 5 (1910) 138.

Usually smaller than the typical plant and more strongly tinged with brown. Leaves spreading in all directions, rarely falcate-secund; costa faint and short or entirely absent in most of the leaves.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13293, Clemens 51915d, 51918a, Williams 1845:* Mount Pulog, *Curran, Merritt & Zschokke 16899:* Abra Province, Mount Bawagan, *Ramos 7314:* Zambales Province, Mount Tapolao, *Ramos 5146; Curran & Merritt 8172, 8178.*

5. Family LEUCOBRYACEÆ

Small to robust, pale-green or whitish plants often tinged with brown. Stems usually branched, radiculose below. Leaves crowded, often fragile, strict or curved; costa broad, in cross section showing a median row of small chlorophyllose cells (chlorocysts) covered on both sides by one or more layers of large, hyaline cells (leucocysts), porose on inner walls, with or without a strand of stereid cells; cells of true lamina large, hyaline, mostly confined to basal portion of leaf near margins. Seta erect, solitary; capsule erect and subcylindric or inclined, asymmetrical and strumose; peristome teeth 8 or 16, entire or cleft above; lid rostrate, calyptra cucullate.

Key to the genera of Leucobryaceæ.

1. Costa with a median strand of stereid cells .... 24. *Leucophanes.*
   Costa without stereid cells .... 2.
2. Chlorocysts in one median row .... 3.
   Chlorocysts in three rows .... 6.
3. Capsules inclined, ovoid, asymmetrical .... 23. *Leucobryum.*
   Capsules erect, cylindric, symmetrical .... 4.
4. Calyptra cucullate .... 26. *Octoblepharum.*
   Calyptra mitriform .... 5.
5. Calyptra fringed at base .... 21. *Schistomitrium.*
   Calyptra entire at base .... 22. *Cladopodanthus.*
6. Dorsal and ventral rows of chlorocysts covered with a layer of large, hyaline cells .... 25. *Arthrocormus.*
   Dorsal and ventral rows of chlorocysts not covered with hyaline cells. 27. *Exodictyon.*

21. Genus SCHISTOMITRIUM Doz. & Molk.

Schistomitrium DOZ. & MOLK., Musc. ined. Archip. Ind. (1845 1848) 67.

Small or robust, densely tufted, pale-green or brownish plants, often glossy. Leaves crowded, rigidly erect-spreading or slightly secund, concave, ovate-lanceolate, subentire, often apiculate and cucullate at apex; costa very broad and flat, in cross section showing a median row of chlorocysts covered on both sides with a single layer of leucocysts, bordered by a narrow band of elongate, hyaline cells representing true lamina. Seta terminal, slender, elongate; capsule erect, cylindric; peristome teeth 16, finely papillose; lid subulate-rostrate from a conic base; calyptra mitriform, typically fringed at base.

Key to the species of Schistomitrium.

1. Robust plants, stems 5 to 6 cm high, leaves over 1 mm wide.
   1. *S. subrobustum.*
   Smaller plants, stems up to 3 cm high, leaves under 1 mm wide.......... 2.
2. Leaves broadly pointed, abruptly cucullate at apex, seta papillose.
   3. *S. Nieuwenhuisii.*
   Leaves gradually pointed, seta smooth.................................. 2. *S. apiculatum.*

1. SCHISTOMITRIUM SUBROBUSTUM Broth. Plate 5, fig. 47.

Schistomitrium subrobustum BROTH., Leafl. Philip. Bot. 6 (1913) 1970.

Robust, glossy plants, whitish green or pale brown. Stems up to 6 cm high, branched. Leaves crowded, erect-spreading on all sides, ovate-lanceolate, deeply concave, entire, up to 7 mm long and 1.4 mm wide, abruptly apiculate and more or less cucullate at apex; costa broad and flat, occupying nearly all of leaf, often scabrous on back near apex; lamina cells long and narrow, forming a hyaline marginal band 4 to 5 rows wide and reaching almost to apex. Seta terminal, erect.

LUZON, Tayabas Province, Lucban, *Elmer 7414;* Infanta, *Robinson 9867.* BASILAN, Entereon, *Reillo 16271.* MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 14111* (type).

Endemic.

A relatively large plant similar in most respects to *S. robustum* Doz. & Molk., but consistently distinct in the narrower border of elongate, hyaline cells. Although uncommon it seems to be widely distributed in the local area.

2. SCHISTOMITRIUM APICULATUM Doz. & Molk. Plate 6, fig. 51.

Schistomitrium apiculatum DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1846) 68.

Relatively small plants with densely tufted, branched stems up to 3 cm high. Leaves crowded, erect-spreading, frequently but not always curved and secund, entire, narrowly ovate-lanceolate, deeply concave, subtubulose above, apiculate, 3.5 to 4.5 mm long; costa broad and flat, bordered below with 3 to 4 rows of elongate, hyaline lamina cells. Seta slender, smooth, erect, about 7 mm long; capsule cylindric, erect, urn 1.5 mm long, gradually tapering to seta; calyptra fringed at base; spores minutely papillose, 10 to 12 µ.

LUZON, Rizal Province, Oriud, *Loher 15186;* Pangasinan Province, Umingan, *Otanes 18356;* Tayabas Province, Baler, *Santos 357;* Camarines Sur Province, Mount Isarog, *Edaño 84212, 84234.* MINDORO, Puerto Galera, *Bartlett 13864.* MINDANAO, Zamboanga Province, *Merrill 8362.*

Distribution: Malay Peninsula, Sumatra, Java, Borneo.

The differences between *S. apiculatum* and *S. Copelandii* are only relative and the latter seems to be only a slightly more robust form with longer, straighter leaves. *S. apiculatum* is, as Fleischer remarks, a very variable species. The leaves are not consistently curved to one side and the specific concept may well include the more robust forms, especially as there are no structural differences.

SCHISTOMITRIUM APICULATUM Doz. & Molk. var. COPELANDII (Broth.) Bartram comb. nov.

Schistomitrium Copelandii BROTH., Philip. Journ. Sci. § C 3 (1908) 13.

Leaves longer, more erect-spreading.

LUZON, Zambales Province, Mount Tapolao, *Ramos 5152.* MINDANAO, Agusan Province, *Weber 1297;* Zamboanga Province, *Copeland "A."* BASILAN, Komalarang, *Reillo 16269.*

Endemic.

4. SCHISTOMITRIUM NIEUWENHUISI Fleisch. Plate 1, fig. 12.

Schistomitrium Nieuwenhuisi FLEISCH., Laubmfl. Java 1 (1900–1902) 161.

Stems up to 3 cm high. Leaves crowded, erect-spreading, oblong-lanceolate, deeply concave, about 4 mm long, abruptly apiculate and cucullate at apex; costa as in *S. subrobustum;* lamina cells forming a very narrow border, 1 to 3 rows wide below and often scarcely evident, usually extending above midleaf. Seta slender, erect, 6 to 7 mm long, more or less scabrous about halfway down; capsule cylindric, erect, 1.8 mm long; peristome teeth pale brown, papillose, strongly articulated; lid conic-rostrate, 1 mm long; calyptra glossy, strongly fringed and notched at base; spores papillose, 12 µ.

LUZON, Abra Province, *Ramos 7310.* MINDORO, Mount Halcon, *Merrill 6209.*

Distribution: Borneo.

In most respects this species is a small edition of *S. subrobustum,* except for the very narrow border of lamina cells and the scabrous setae.

22. Genus CLADOPODANTHUS Doz. & Molk.

Cladopodanthus Doz. & Molk., Musc. Frond. ined. Archip. Ind. (1846) 70.

Rather robust plants, densely matted. Stems ascending, branched. Leaves very crowded, erect, appressed, closely imbricated, oblong, concave, apiculate, apex truncate or rounded and cucullate; costa very broad and flat, in cross section showing a median row of chlorocysts with a single layer of leucocysts on both sides, bordered below by 2 to 3 rows of elongated, hyaline lamina cells. Fruit usually produced at ends of short lateral branches; seta slender; capsule erect; calyptra slightly notched or lobed at base.

Key to the species of Cladopodanthus.

Leaves truncate, minutely apiculate .... 2. *C. muticus.*
Leaves rounded at apex, cucullate .... 1. *C. speciosus.*

1. **CLADOPODANTHUS SPECIOSUS** (Doz. & Molk.) Fleisch. Plate 5, fig. 10.

Cladopodanthus speciosus (Doz. & Molk.) Fleisch., Laubfl. Java 1 (1900–1902) 156.

Dioicous; robust plants in deep, laxly adherent tufts, pale green with a brownish tinge. Stems ascending, forked, brittle, up to 7 cm long, densely foliate and tumid. Leaves erect, appressed, closely imbricated, oblong, concave, rounded and cucullate at apex with a short apiculus, 2 mm long and 0.8 mm wide, lamina cells linear-rhomboidal, hyaline, in 2 or 3 rows, forming a very narrow border. Sporophyte terminal, becoming lateral by innovating stem; perichætial leaves short-acuminate, with a border of 3 to 5 rows of lamina cells; seta slender, smooth, 7 to 10 mm long; capsule cylindric, erect; peristome teeth short, deeply inserted, papillose; lid subulate-rostrate; calyptra mitriform, slightly lobed at base.

Luzon, Tayabas Province, Kabatangan, Baler, *Santos 228*.

Distribution: Java, Celebes, Borneo.

On branch of tree. This striking plant is a welcome addition to the local flora. The thick, julaceous stems have a very characteristic appearance due to the peculiar foliation.

2. **CLADOPODANTHUS MUTICUS** Broth. Plate 5, fig. 11.

Cladopodanthus muticus Broth., Philip. Journ. Sci. 31 (1926) 279.

Cladopodanthus truncatus Dix., Linn. Soc. Journ. Bot. (333) 1 (1935) 73.

Densely matted, pale yellowish-green plants, brown below, slightly glossy. Stems prostrate or ascending, copiously branched, branches short and blunt. Leaves erect, appressed, densely imbricated, oblong, broadly concave, entire, subtubulose above, 2.5 mm long and 0.5 mm wide, apex rounded or broadly truncate, often minutely apiculate; costa broad; lamina cells elongate, hyaline, porose, forming a narrow border 2 to 4 cells wide below, narrower upward and reduced to one row in upper part of leaf. Seta slender, short; calyptra conic-mitriform, subentire at base.

PANAY, Salibongbong, *Martelino & Edaño 35787*.

Distribution: Borneo.

Brotherus has hardly done justice to the striking leaf characters of this plant in the original description. In the Philippine plants the truncate apex is probably the exception rather than the rule, but the reverse is true of the collection from Borneo in which the apex is squarely truncate so that the angles shortly project in two small horns, as Dixon has remarked. In all other respects the plants are identical.

23. Genus LEUCOBRYUM Hampe

Leucobryum HAMPE, Flora 20 (1837) 282.

Small or medium-sized plants, pale or glaucous green tinged with brown. Stems branched, radiculose below. Leaves crowded, strict or curved, from a small ovate base narrowed to a subtubulose point; costa broad, occupying all of upper part of leaf, often rough on back toward apex, composed of two or more layers of leucocysts enclosing a median row of small chlorocysts. Seta terminal, erect; capsule inclined, asymmetrical, furrowed when dry; peristome teeth 16, reddish, striolate below, divided to about middle into two pale, papillose forks.

Key to the species of Leucobryum.

1. Leaves auriculate at base, leucocysts in two layers throughout leaf ..... 2.
Leaves not auriculate, leucocysts usually in more than two layers near base ..... 3.
2. Leaves falcate, not apiculate, scabrous on back ..... 1. *L. candidum.*
Leaves erect-spreading, sharply apiculate, smooth on back. 2. *L. subsanctum.*
3. Leaves smooth on back ..... 4.
Leaves strongly scabrous on back ..... 5.
4. Silky plants with slender, flexuose leaves, leucocysts in 2 or 3 layers near base, cells narrow with thickened, pitted lateral walls. 3. *L. Bowringii.*
Coarser plants with shorter, more rigid leaves, leucocysts in 5 or 6 layers near base, lamina cells wider with thin, straight lateral walls. 4. *L. neilgherrense.*

5. Leaves spirally imbricated around stem........................ 7. *L. pentastichum.*
Leaves not spirally imbricated.. 6.
6. Leaves 3 or 4 mm long, less than 1 mm wide........................ 6. *L. scalare.*
Leaves up to 15 mm long, more than 1 mm wide.................. 5. *L. javense.*

1. LEUCOBRYUM SANCTUM Hampe. Plate 5, fig. 72.

Leucobryum sanctum HAMPE, Linnaea (1839) 42.

Robust plants growing in dense, deep tufts, pale green tinged with brown, iridescent when dry. Leaves erect-spreading, flexuose and usually slightly secund, up to 7 mm long and 1.5 mm wide, rather abruptly lanceolate-subulate from an oblong base, canaliculate-concave above; costa scabrous on back above, in cross section showing a single layer of leucocysts on both sides of chlorocysts throughout leaf, chlorocysts nearer dorsal surface toward base and nearer ventral surface above; lamina cells in 3 or 4 rows below, at basal angles enlarged forming distinct hyaline auricles. Perichætial leaves about half the size of stem leaves, not auriculate, lamina cells in about 10 rows at widest part. Seta bright reddish brown, smooth, 2 cm long; capsule inclined, strongly strumose, sulcate, asymmetrical, urn 1.4 mm long.

Numerous collections from Luzon, Mindoro, Palawan, Negros, Polillo, Mindanao, Samar, and Basilan.

Distribution: India, Malaysia, New Guinea, Fiji, Samoa.

A common species in the Philippines and one with a wide geographical distribution. It is readily separated from all the local species except *L. subsanctum* by the costal structure and the conspicuous hyaline auricles.

2. LEUCOBRYUM SUBSANCTUM Broth. Plate 5, fig. 73.

Leucobryum subsanctum BROTH., Philip. Journ. Sci. § C 2 (1907) 339.

In size, appearance, and structure very similar to *L. sanctum* but distinct in the following details which seem to be consistently maintained: Leaves erect-spreading on all sides, not secund, minutely but sharply apiculate at apex, smooth on back above. Seta slightly scabrous above; capsule suberect, nearly symmetrical and only slightly strumose.

LUZON, Bataan Province, Mount Mariveles, *Merrill 3540, 3549*; Upper Lamao River, *Williams 843*; Tayabas Province, Baler, *Santos 298*. MINDORO, Mindoro Province, Halcon, *Merrill 6208*. NEGROS, Negros Occidental Province, Fabrica, *Chapman 50*.

3. LEUCOBRYUM BOWRINGII Mitt. Plate 6, fig. 74.

Leucobryum Bowringii MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 26.

Medium-sized, densely tufted plants with a silky appearance. Leaves crowded, flexuose, usually falcate-secund, up to 10 mm long, from a small concave ovate base narrowed to a long, slender, tubulose point; costa thin, smooth on back above, in cross section showing one layer of leucocysts on both sides of row of chlorocysts, often transversely divided near base and appearing as two layers; lamina cells very narrow, incrassate, pitted, in 10 to 12 rows at widest part of leaf. Seta slender, reddish, up to 2 cm long; capsule horizontal, lightly sulcate, strongly strumose.

BATAN, Santo Domingo de Basco, *Fenix 3855*. LUZON, Cagayan Province, Mount Bawa, *Edaño 79701, 79706, 79707:* Mount Balatongan, *Edaño 79711, 79723;* Kilingkiling, *Edaño 79745;* Mount Cagua, *Edaño 79730, 79730, 79741:* Benguet Subprovince, Baguio, *Elmer 8661:* Bataan Province, Mount Mariveles, *Merrill 3548* in part; Laguna Province, San Antonio, *Ramos 20015;* Mount Maquiling, *Robinson 17055:* Zambales Province, *Curran & Merritt 8181:* Mountain Province, Apayao, Mount Sulu, *Fenix 28451*. SIBUYAN, Magallanes, Mount Gitinjogitinjo, *Elmer 12312*. NEGROS, Occidental Negros Province, Fabrica, *Chapman 49*.

Distribution: Ceylon, Malaysia, China, Japan, Formosa.

The narrow, flexuose leaves and especially the linear, thick-walled lamina cells are good diagnostic characters.

LEUCOBRYUM BOWRINGII Mitt. var. SERICEUM (Broth.) Dix.

Leucobryum Bowringii Mitt. var. *sericeum* (Broth.) Dix., Ann. Bryol. 5 (1932) 24.

Leucobryum sericeum Broth., Bibl. Bot. (1898) 29, *pl. 4*.

Leaves narrower; costa in cross section showing leucocysts more uniformly in two layers, rarely transversely divided.

LUZON, Cagayan Province, Mount Bawa, *Edaño 80925;* Mount Cuera, *Curran 16869;* Tamdagan River, *Edaño 79782:* Camarines Sur Province, Mount Madooy, *Edaño 34240*. TICAS GRANDE, *Ramos & Pascasio 35932*. SIBUYAN, Magallanes, *Elmer 12301*. PANAY, Capiz Province, *Martelino & Edaño 35763*.

4. LEUCOBRYUM NEILGHERRENSE C. M. Plate 4, fig. 75.

Leucobryum neilgherrense C. M., Bot. Zeit. (1854) 550.

Medium-sized, pale-green plants, slightly glossy. Stems up to 3 cm high. Leaves crowded, erect-spreading, rather rigid, up to 8 mm long, from a narrow, ovate, concave base gradually narrowed to a coarse, rigid, deeply channeled point, minutely apiculate at apex; costa smooth on back above, in cross section near base showing 3 rows of leucocysts on dorsal side and 2 rows on ventral side of chlorocysts in thickest parts, along median furrow one layer of leucocysts on each side; lamina cells linear toward margins, rectangular within, with straight lateral walls, in 10 to 12 rows near base forming a distinct hyaline border.

LUZON, Benguet Subprovince, Mount Santo Tomas, trees in fog area, *Hadden 113a;* Mount Data, 6,000 feet, *Hadden 113.*

Distribution: India, Ceylon, Sumatra, Java, Celebes, Borneo, Tonkin, China, Japan, Korea.

This species is ordinarily a distinctly coarser plant than *L. Bowringii*, with more rigid, broadly pointed, leaves and thicker costa. The hyaline lamina cells are wider toward the edges of the costa and not at all pitted.

6. **LEUCOBRYUM JAVENSE** (Brid.) Mitt. Plate 5, fig. 16.

Leucobryum javense (Brid.) MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 25.

Sphagnum javense BRID., Bryol. Univ. 1 (1826) 19.

Robust plants growing in deep tufts, glaucous green tinged with yellow or brown. Stems up to 6 cm long or longer. Leaves very crowded, usually falcate-secund, up to 14 mm long and 2.5 mm wide, gradually lanceolate from a large, concave base, deeply grooved in the point, apiculate, very rugose on back in upper half; costa in cross section near base showing one layer of leucocysts on both sides of chlorocysts in median portion and 2 or 3 layers on both sides in thicker parts of leaf; lamina cells in 4 to 6 rows, narrowly rectangular and 10 to 12 µ wide next to costa, linear toward margins. Seta about 2.5 cm long, reddish, soon becoming lateral by elongating stems; capsule short-oblong, inclined, strumose, sulcate when dry; peristome teeth dark red, split to about middle into 2 equal forks; annulus none; lid conic-rostrate.

LUZON, frequent throughout the island. MINDORO, Puerto Galera, *Bartlett 13871.* NEGROS, Canlaon Volcano, *Merrill 6806;* Oriental Negros Province, Cuerno de Negros, *Magdamo 88.* MINDANAO, Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4792:* Davao Province, Todaya, Mount Apo, *Elmer 11864;* Lanao Province, Palao Amopu, *Bartlett 15961, 15978.*

Distribution: Southern India, Ceylon, Malaysia, New Guinea, Yunnan, Hongkong.

A fine plant that attracts attention at once by its large size and its crowded, curved leaves, rough on the back.

6. **LEUCOBRYUM SCALARE C. M.** Plate 5, fig. 77.

Leucobryum scalare C. M. in Micholitz, Musc. Philip. No. 173.

Relatively small, densely tufted, pale-green plants, scarcely glossy. Stems 1 to 2 cm high, branches short. Leaves crowded, falcate-secund, often radiculose at tips, very rugose on back in upper half, up to 3 mm long, from an ovate base gradually narrowed to a coarse, subtubulose acuminate point; costa in cross section near base showing two layers of leucocysts on both sides of chlorocysts in thicker parts of leaf; hyaline lamina cells in 4 or 5 rows at widest part of leaf, narrowly rectangular toward costa and linear at margins.

LUZON, frequent throughout the island. PANAY, Capiz Province, Libucao, *Martelino & Edaño 35784*. MINDORO, Puerto Galera, *Bartlett 15894*.

Distribution: Nepal, Malacca, Java, Sumatra, Borneo.

A variable species, but usually easy to recognize by the short, crowded, slightly curved leaves very rough on the back in the upper half so that, in profile, the projections suggest a flight of steps in miniature, whence the specific name.

LEUCOBRYUM SCALARE C. M. var. TJIBODENSE Fleisch.

Leucobryum scalare C. M. var. *tjibodense* FLEISCH., Laubfl. Java 1 (1900–1902) 145.

Leaves more erect and more sharply pointed.

LUZON, Bontoc Subprovince, *Vanoverbergh 8064*. MINDANAO, Camiguin de Mindanao, *Ramos 14877*.

Distribution: Java, Tahiti.

7. **LEUCOBRYUM PENTASTICHUM Doz. & Molk.** Plate 5, fig. 78.

Leucobryum pentastichum DOZ. & MOLK., Bryol. Jav. 1 (1855) 16, *pl. 15*.

Medium-sized, rather slender, glossy plants, densely tufted. Stems up to 4 to 5 cm long, flexuose, 5-angled. Leaves crowded, falcate-secund, spirally imbricated in 5 rows, up to 5 mm long, ovate-lanceolate, concave below, subtubulose in the point; costa thick, very scabrous on back about one-third way down, in cross section showing 2 or 3 layers of leucocysts on both sides of chlorocysts in thicker parts of leaf; lamina cells in 4 or 5 rows at widest part of leaf, linear at margins, wider and rectangular toward costa.

NEGROS, Oriental Negros Province, Dumaguete, *Chapman 23*. PANAY, Antique Province, *McGregor 32624*; Capiz Province, *Edaño 40289*.

Distribution: Java, Borneo, Siam, Fiji.

The spirally imbricated leaves afford a good character when well developed, but this leaf arrangement is not always evident. In this case the plants are hard to separate satisfactorily from *L. scalare* and the allied species.

24. Genus LEUCOPHANES Hampe

Leucophanes HAMPE, Flora (1837) 282.

Slender, pale-green or whitish plants. Stems branched. Leaves rather crowded, erect or widely spreading, narrowly lanceolate, strongly keeled; costa broad and thin, with a median strand of stereid cells, usually nearer dorsal side, either smooth or toothed on back near apex; leucocysts in two layers throughout leaf or in 3 or more layers near base; bordered all around with a narrow band of very elongate cells with thickened, yellowish walls; lamina cells few, usually confined to marginal part of leaf base. Seta very slender, terminal, soon becoming lateral; capsule erect, cylindric, glossy; peristome teeth 16, entire, papillose; lid erect, long-subulate; calyptra cucullate, entire at base.

Key to the species of Leucophanes.

1. Median stereid strand spinose on back .... 2. *L. albescens.*
Median stereid strand smooth on back .... 2.
2. Robust, glossy plants, leaves keeled above .... 1. *L. candidum.*
Slender, dull, delicate plants, leaves nearly flat above.
3. *L. octoblepharioides.*

1. LEUCOPHANES CANDIDUM (Hornsch.) Lindb. Plate 6, fig. 29.

Leucophanes candidum (Hornsch.) LINDB., Oefv. Vet. Akad. Foch. (1864) 602.

Syrrhopodon candidus HORNSCH., Nov. Act. Acad. 14 (1826) 701.

Compactly tufted, glossy, whitish-green plants often tinged with brown. Stems up to 6 cm long, fragile, usually densely matted but easily separating. Leaves crowded, erect or widely spreading, ovate-lanceolate, short-apiculate, 3 to 3.5 mm long, strongly carinate in upper half; margins erect, minutely denticulate toward apex, bordered all around with a narrow band of very elongate, incrassate cells 3 or 4 rows wide; costa broad and thin, occupying most of leaf, in cross section showing one layer of leucocysts on each side of row of chlorocysts and a slender median bundle of yellowish stereid cells which is smooth on the back and confluent with the border cells in a short, toothed apiculus; lamina cells rectangular, hyaline, in one layer, in a narrow band 3 cells wide at leaf base between costa and border. Seta about 1 cm long, slender, reddish; capsule erect, cylindric, urn 1 mm long, brown, lustrous, slightly striate when dry; lid subulate-rostrate, longer than urn.

BATAN, Mount Iraya, *Bartlett 15465* in part. LUZON, Rizal Province, *Reillo 19816;* Lumutan, *Ramos and Edaño 29817:* Laguna Province, Mount Maquiling, *Bartlett 15603, 15666, 15706:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16000.* MINDORO, Alag River, *Merrill 5632.* PALAWAN, Rio Balsajan, *Foxworthy 759;* Mount Manalsal, *Edaño 80873.* BASILAN, Kirmalarang, *Reillo 16274.* PANAY, Capiz Province, Libacao, *Martelino and Edaño 35773, 35780.* MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens 4;* Puggan Hill, *Bartlett 15890;* Sax River, *Williams 2395.* JOLO, Sulu Province, Bud Sungal, *Bartlett 16071, 16079;* Bud Kaunayan, *Bartlett 16097, 16103.*

Distribution: Ceylon, Malaysia, New Guinea, Fiji, Samoa.

A variable species in habit and color. A more robust plant than any of its allies, distinguishable from *L. octoblepharioides* by the strongly keeled leaves.

LEUCOPHANES CANDIDUM (Hornsch.) Lindb. var. DENSIFOLIUM (Mitt.) Dix.

Leucophanes candidum (Hornsch.) Lindb. var. *densifolium* (Mitt.) Dix., Ann. Bryol. 7 (1934) 23.

Leucophanes densifolium MITT., Bonplandia (1861) 366.

Leaves densely crowded, erect, strongly tinged with brown.

LUZON, Bataan Province, Upper Lamao River, *Williams 840;* Sorsogon Province, *Ramos 22745;* Tayabas Province, Baler, *Santos 350;* Quinatacalan, *Foxworthy & Ramos 13211.* PANAY, Capiz Province, Libacao, *Martelino & Edaño 35709.* MINDORO, Puerto Galera, *Bartlett 13652.* SAMAR, Catbalogan, *Ramos 17622.* MINDANAO, Agusan Province, *Weber 1332.*

Distribution: Celebes, Borneo, Fiji.

Well marked in the extremes but grading insensibly into the typical form.

4. LEUCOPHANES ALBESCENS C. M. Plate 4, fig. 14.

Leucophanes albescens C. M., Bot. Zeit. (1864) 347.

Medium-sized, glossy plants, rather loosely tufted. Stems up to 3 cm high. Upper leaves crowded, more distant below, slightly contorted and undulate on edges when dry, erect-spreading when moist, linear-lanceolate, 5 mm long and 0.5 mm wide, carinate-concave the entire length, distantly serrate near apex with teeth often in pairs; costa with a median bundle of stereid cells ending in apex and minutely spinose on back about halfway down, in cross section showing 2 or 3 layers of leucocysts on dorsal side and one layer on ventral side of chlorocysts in the thicker parts near base, and a single row of leucocysts on each side higher in leaf; lamina cells rather conspicuous, extending about halfway up the leaf, up to 25 µ wide, quadrate or short rectangular with the delicate walls often sinuose, 4 or 5 rows wide below, narrower above.

LUZON, Rizal Province, Antipolo, *Ramos & Edaño 29576*: Zambales Province, Mount Lalol near Mount Kutoh, *Ebalo 5*: Tayabas Province, Mauban, *Pastrana 22, 71, 77, 83*. POLILLO, south of town, *Robinson 9066*. MINDANAO, Surigao Province, Agusan Valley, *Hutchinson 7603*.

Distribution: Siam, Java, Celebes, New Guinea, Borneo.

The keeled leaves, spinose on the back of the median stereid strand, and the paired marginal teeth make this an easy species to segregate.

6. LEUCOPHANES OCTOBLEPHARIOIDES Brid. Plate 6, fig. 51.

Leucophanes octoblepharioides BRID., Bryol. Univ. 1 (1826) 763.

Slenderer and more delicate than *L. candidum* and less densely tufted. Leaves erect-spreading, linear-lanceolate, nearly flat, only slightly concave in upper half, 3 to 3.5 mm long; costa thickened on both sides of stereid strand, in cross section showing one layer of leucocysts on both sides of chlorocyst row throughout base and a median bundle of stereid cells which ends in or just below abruptly pointed, toothed apex; toward base leucocysts on dorsal side much larger than those on ventral side, in upper part of leaf ventral layer larger than dorsal layer; lamina cells short-rectangular or subquadrate, up to 25 µ wide, in 4 or 5 rows, extending well up leaf base.

PANAY, Capiz Province, Mount Bulilao, *Martelino & Edaño 35819, 35822*.

Distribution: Wide, Nepal to the Pacific islands.

These plants are typical in most respects except the structure of the leaf base which shows only 2 layers of leucocysts. The narrow leaves, shallowly convex above, and the wider lamina cells in a broader band will distinguish this species from *L. candidum*. *L. octoblepharioides* may prove to be a distinct, endemic species, but I am more inclined to think that the difference in the structure of the leaf base is outweighed by the agreement in other essential characters.

25. Genus OCTOBLEPHARUM Hedwig

Octoblepharum HEDWIG, Sp. Musc. (1801) 50.

Autoicous; male buds minute, axillary. Compactly tufted, glossy plants, whitish green tinged with brown. Leaves crowded, rigid, often fragile, consisting chiefly of broad, thick, ligulate costa bordered at base by delicate, hyaline cells of rudimentary lamina. Seta erect; capsule erect, symmetrical; peristome teeth 16, in 8 pairs, faintly striolate; lid conic-rostrate; calyptra cucullate, entire at base.

OCTOBLEPHARUM ALBIDUM Hedw. Plate 4, fig. 32.

Octoblepharum albidum HEDW., Sp. Musc. (1801) 50.
Octoblepharum cuspidatum C. M., Forschungsreise Bot. 57, *nomen.*

Fragile, rather glossy plants, up to 3 cm high, in dense tufts or cushions. Leaves crowded, widely spreading or recurved, rigid, ligulate, from an oblong or narrowly obovate, concave base, rounded and apiculate at apex, up to 8 mm long, serrulate near apex; costa broad and thick, occupying half of leaf base and entire blade, in cross section near middle showing a median row of small, triangular chlorocysts with 3 or 4 layers of leucocysts on both dorsal and ventral sides; hyaline lamina cells rectangular, up to 30 μ wide, narrower and rhomboidal toward margins. Perichætial leaves smaller than stem leaves; seta erect, slender, 5 to 6 mm long; capsule erect, oblong-ovoid, urn 1.5 mm long; peristome teeth in 8 pairs, yellowish, well spaced; lid shorter than urn.

LUZON, numerous collections from various localities. PANAY, Iloilo Province, *Robinson 18220*. NEGROS, Negros Oriental Province, Dumaguete, *Elmer 10035a*. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens "O"*; Santa Cruz, *Williams 3005*.

Distribution: Cosmopolitan at low altitudes in tropical regions.

I have a bit of the original specimen of *O. cuspidatum* through the kindness of Doctor Reimers, and find it inseparable from *O. albidum*. A cross section from the upper part of the leaf blade shows the leucocysts in 4 layers. It appears to be a rather lax, soft form, possibly from a densely shaded habitat, but shows no distinctive characters of specific value.

on dorsal side and one layer on ventral side of chlorocysts in the thicker parts near base, and a single row of leucocysts on each side higher in leaf; lamina cells rather conspicuous, extending about halfway up the leaf, up to 25 μ wide, quadrate or short rectangular with the delicate walls often sinuose, 4 or 5 rows wide below, narrower above.

LUZON, Rizal Province, Antipolo, *Ramos & Edaño 29576*: Zambales Province, Mount Lalol near Mount Kutoh, *Ebalo 5*: Tayabas Province, Mauban, *Pastrana 22, 71, 77, 83*. POLILLO, south of town, *Robinson 9066*. MINDANAO, Surigao Province, Agusan Valley, *Hutchinson 7603*.

Distribution: Siam, Java, Celebes, New Guinea, Borneo.

The keeled leaves, spinose on the back of the median stereid strand, and the paired marginal teeth make this an easy species to segregate.

6. LEUCOPHANES OCTOBLEPHARIOIDES Brid. Plate 4, fig. 81.

Leucophanes octoblepharioides BRID., Bryol. Univ. 1 (1826) 763.

Slenderer and more delicate than *L. candidum* and less densely tufted. Leaves erect-spreading, linear-lanceolate, nearly flat, only slightly concave in upper half, 3 to 3.5 mm long; costa thickened on both sides of stereid strand, in cross section showing one layer of leucocysts on both sides of chlorocyst row throughout base and a median bundle of stereid cells which ends in or just below abruptly pointed, toothed apex; toward base leucocysts on dorsal side much larger than those on ventral side, in upper part of leaf ventral layer larger than dorsal layer; lamina cells short-rectangular or subquadrate, up to 25 μ wide, in 4 or 5 rows, extending well up leaf base.

PANAY, Capiz Province, Mount Bulilao, *Martelino & Edaño 35819, 35822*.

Distribution: Wide, Nepal to the Pacific islands.

These plants are typical in most respects except the structure of the leaf base which shows only 2 layers of leucocysts. The narrow leaves, shallowly convex above, and the wider lamina cells in a broader band will distinguish this species from *L. candidum*. *L. octoblepharioides* may prove to be a distinct, endemic species, but I am more inclined to think that the difference in the structure of the leaf base is outweighed by the agreement in other essential characters.

25. Genus OCTOBLEPHARUM Hedwig

Octoblepharum Hedwig, Sp. Musc. (1801) 50.

Autoicous; male buds minute, axillary. Compactly tufted, glossy plants, whitish green tinged with brown. Leaves crowded, rigid, often fragile, consisting chiefly of broad, thick, ligulate costa bordered at base by delicate, hyaline cells of rudimentary lamina. Seta erect; capsule erect, symmetrical; peristome teeth 16, in 8 pairs, faintly striolate; lid conic-rostrate; calyptra cucullate, entire at base.

OCTOBLEPHARUM ALBIDUM Hedw. Plate 5, fig. 91.

Octoblepharum albidum Hedw., Sp. Musc. (1801) 50.
Octoblepharum cuspidatum C. M., Forschungsreise Bot. 57, *nomen.*

Fragile, rather glossy plants, up to 3 cm high, in dense tufts or cushions. Leaves crowded, widely spreading or recurved, rigid, ligulate, from an oblong or narrowly obovate, concave base, rounded and apiculate at apex, up to 8 mm long, serrulate near apex; costa broad and thick, occupying half of leaf base and entire blade, in cross section near middle showing a median row of small, triangular chlorocysts with 3 or 4 layers of leucocysts on both dorsal and ventral sides; hyaline lamina cells rectangular, up to 30 μ wide, narrower and rhomboidal toward margins. Perichaetial leaves smaller than stem leaves; seta erect, slender, 5 to 6 mm long; capsule erect, oblong-ovoid, urn 1.5 mm long; peristome teeth in 8 pairs, yellowish, well spaced; lid shorter than urn.

LUZON, numerous collections from various localities. PANAY, Iloilo Province, *Robinson 18220.* NEGROS, Negros Oriental Province, Dumaguete, *Elmer 10085a.* MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens "O"*; Santa Cruz, *Williams 3095.*

Distribution: Cosmopolitan at low altitudes in tropical regions.

I have a bit of the original specimen of *O. cuspidatum* through the kindness of Doctor Reimers, and find it inseparable from *O. albidum.* A cross section from the upper part of the leaf blade shows the leucocysts in 4 layers. It appears to be a rather lax, soft form, possibly from a densely shaded habitat, but shows no distinctive characters of specific value.

26. Genus ARTHROCORMUS Doz. & Molk.

Arthrocormus Doz. & Molk., Musc. ined. Archip. Ind. (1845–1848) 75.

Dioicous; slender, rigid, fragile plants, whitish green tinged with brown, lustrous and slightly iridescent when dry. Stems erect, branched, up to 2 cm high. Leaves crowded, very brittle, rigidly erect-spreading, indistinctly 3-ranked, usually broken off about halfway down, linear from a narrow, concave, hyaline base, abruptly and sharply pointed; costa thick, convex on back, triangular toward apex, in cross section showing a median row of chlorocysts with about 4 layers of leucocysts on both sides, then a row of chlorocysts on both dorsal and ventral sides covered with a single surface layer of leucocysts all around; hyaline lamina cells occupying two-thirds of leaf base, linear in 2 or 3 rows at margins then abruptly larger and rectangular in 5 or 6 rows toward costa. Seta slender, erect; capsule erect, cylindric; peristome teeth short, blunt, papillose, in 8 pairs; lid conic-rostrate; calyptra cucullate, entire at base.

ARTHROCORMUS SCHIMPERI Doz. & Molk. Plate 6, fig. 51.

Arthrocormus Schimperi Doz. & Molk., Musc. Frond. ined. Archip. Ind. (1846) 76, *pl.* 27.

Slender, fragile, whitish plants with the characters of the genus. Leaves up to 5 to 6 mm long; costa near base convex on back, concave on inner side, in cross section with a median row of chlorocysts and 2 layers of leucocysts on both sides; the typical structure of the costa is shown in the blade where the chlorocysts are in 3 rows, covered on the dorsal and ventral sides with a single layer of leucocysts.

LUZON, Cagayan Province, Pagikpik, *Edaño 70785*: Nueva Ecija Province, Bongabong, *Santos 195*: Laguna Province, San Antonio, *Ramos 16070* in part, *10090* in part. MINDORO, Lake Naujan, *Bartlett 13559*. NEGROS, Occidental Negros Province, Gimagaan River, *Whitford 1487a*; Fabrica, *Chapman 51*.

Distribution: Ceylon, Malaysia to Fiji and Tahiti.

This remarkable little plant corresponds in every particular field by the narrower, more brittle leaves. In any event the

Slender, tufted plants with erect stems up to 2 cm long or unique structure of the costa will identify the plant without any question. Local collections are generally small, and the plants are often associated with *Syrrhopodon* spp. on the bark of trees.

27. Genus EXODICTYON Card.

Exodictyon Card., Rev. Bryol. (1899) 6.

Dioicous; slender, tufted plants, whitish green or brown, scarcely glossy. Stems erect, simple or branched. Leaves rigid, widely spreading, linear from a narrowly ovate, clasping, hyaline base; costa thick, rounded on back, triangular toward apex, often papillose or spinose on both sides above, in cross section showing 3 rows of chlorocysts, one median, one on ventral surface and one on dorsal surface, separated by 2 or 3 layers of leucocysts on both sides of median row; lamina cells short-rectangular, in 5 or 6 rows at base and extending upward on both sides of costa nearly to apex in a narrow band 1 or 2 cells wide and bordered all around with 2 or 3 rows of long, narrow, thick-walled, yellowish cells in one or more layers and often papillose in blade. Seta slender; capsule erect, cylindric, lustrous; peristome teeth 16, papillose; lid long-beaked; calyptra cucullate, entire.

Key to the species of Exodictyon.

Leaf margins and costa densely spinose-hispid................ 1. *E. Sullivantii.*
Leaf margins and costa not spinose-hispid......................... 2. *E. Blumii.*

EXODICTYON SULLIVANTII (Doz. & Molk.) Fleisch. Plate 6, fig. 64.

Exodictyon Sullivantii (Doz. & Molk.) FLEISCH., Laubmfl. Java 1 (1900–1902) 152.
Syrrhopodon Sullivantii DOZ. & MOLK., Bryol. Jav. 1 (1856) 68.

Smaller than *E. Blumii.* Stems laxly tufted. Leaves up to 2 mm long, linear from an erect, clasping base, sharply apiculate at apex, densely spinose-hispid on margins and on both sides of costa from about middle of leaf base to apex, bordered all around with 2 or 3 rows of narrow, elongate cells in one layer; structure of costa in cross section as in *E. Blumii;* hyaline lamina cells extending upward along costa nearly to apex. Sporophyte not seen.

LUZON, Tayabas Province, Dimasingay, Baler, *Santos 855* in part.

Distribution: Java.

This remarkable little plant corresponds in every particular with the description of *E. Sullivantii.* The dense armature of the leaves is a very conspicuous feature and distinguishes it at a glance from *E. Blumii.*

2. EXODICTYON BLUMII (C. M.) Fleisch. Plate 6, fig. 65.

Exodictyon Blumii (C. M.) FLEISCH., Laubmfl. Java 1 (1900–1902) 158.
Leucophanes Blumii C. M., Syn. 2 (1851) 537.

Slender, tufted plants with erect stems up to 2 cm long or longer. Leaves rigid with widely spreading points, linear from an erect, clasping base, blunt at apex, about 4 mm long, serrulate in upper half and spinose-serrate at leaf shoulders, bordered from insertion nearly to apex with 3 or 4 rows of very narrow, elongate, incrassate cells often more or less papillose in blade; costa occupying less than one fourth of leaf base, spinose on both sides more than halfway down; hyaline lamina cells short-rectangular, up to 25 μ wide, in 6 or 7 rows in leaf base and 1 or 2 rows above, extending upward along costa nearly to apex.

BATAN, Mount Iraya, *Bartlett 15472, 15474, 15480;* Santo Domingo de Basco, near summit of Mount Grada, *Fenix 3857.* LUZON, Laguna Province, San Antonio, *Ramos 16670* in part; Mount Maquiling, *Hadden 114:* Camarines Sur Province, Botol River, *Edaño 84265.* NEGROS, Oriental Negros Province, Dumaguete, *Chapman 18.*

Distribution: Java, Borneo.

The leaves of this species are more widely spreading and less brittle than those of *Arthrocormus Schimperi.* Under the microscope the scabrous costa is a salient feature. The plants are more likely to be confused with some of the species of *Syrrhopodon* in the *Leucophanella* group, but can always be definitely placed by the structure of the costa in cross section.

6. Family CALYMPERACEÆ

Dioicous, rarely autoicous. Small or robust, tufted plants, usually growing on trees. Stems mostly erect, branched, radiculose below. Leaves crowded, sheathing at base, usually with a hyaline or thickened border that is occasionally winged in blade; costa strong, convex on back, often papillose or spinose on one or both sides, ending near apex or excurrent, frequently with clusters of spindle-shaped propagula at tip; interior cells of leaf base (cancellinæ) large, rectangular or quadrate, hyaline, changing abruptly to the small, rounded or hexagonal and often papillose cells of leaf blade. Perichætial leaves scarcely differentiated; seta elongate, slender; capsule erect, cylindric; peristome single, of 16 deeply inserted teeth, or none; lid conic-rostrate; annulus none; calyptra covering capsule, cucullate or campanulate, often scabrous near apex.

Key to the genera of Calymperaceæ.

1. Peristome none, leaves without a hyaline border............ 30. *Calymperes.*
   Peristome present, leaves usually hyaline-bordered.................................. 2.
2. Stems erect, setæ terminal, hyaline border narrow........ 28. *Syrrhopodon.*
   Stems creeping, setæ at ends of branches, hyaline border broad.
   29. *Thyridium.*

23. Genus SYRRHOPODON Schwaegr.

Syrrhopodon SCHWAEGR., Suppl. 2 pt. 2 (1824) 110.

Small or medium sized plants growing in tufts or cushions, mostly on trees. Stems erect. Leaves crowded, strict or contorted, lanceolate or linear-lanceolate from an erect, clasping, whitish base, usually with a narrow hyaline border, more rarely with a thickened concolorous border or unbordered; costa strong, ending in or near apex; upper cells small, usually more or less papillose, changing abruptly to large, hyaline cells (cancellinæ) of leaf blade. Capsule erect, cylindric; peristome single, of 16 papillose teeth; calyptra cucullate.

Key to the species of Syrrhopodon.

1. Leaves with a hyaline border of narrow, elongate cells .... 2.
Leaves not bordered with elongate cells .... 13.
2. Inner cancellinæ cells extending to or beyond midleaf .... 3.
Cancellinæ cells confined to leaf base .... 6.
3. Leaves erect, appressed when dry .... 4.
Leaves with spreading, flexuose points when dry .... 5.
4. Upper chlorophyllose leaf cells smooth, distinct .... 1. *S. revolutus.*
Upper chlorophyllose leaf cells papillose, more or less obscure.
2. *S. borneensis.*
5. Leaf margin entire .... 3. *S. rufescens.*
Leaf margin sharply serrate above .... 4. *S. amoenus.*
6. Margins of leaf base entire .... 7.
Margins of leaf base toothed .... 10.
7. Leaves crowded, margins of leaf blade entire .... 8.
Leaves distant, margins of leaf blade toothed .... 9.
8. Leaves oblong, 1.5 to 2 mm long .... 5. *S. Bartletti.*
Leaves linear-lanceolate, 3.5 to 4 mm long .... 7. *S. flammeo-nervis.*
9. Leaves from 6 to 8 mm long, costa nearly smooth .... 8. *S. tristichus.*
Leaves less than 3 mm long, costa spinose on back.
6. *S. albo-vaginatus.*
10. Leaf margins long-ciliate .... 11.
Leaf margins toothed but not ciliate .... 12.
11. Margins ciliate nearly to apex .... 12. *S. ciliatus.*
Margins ciliate only at leaf shoulders .... 11. *S. philippinensis.*
12. Costa spinose on both sides .... 10. *S. spiculosus.*
Costa smooth .... 9. *S. Semperi.*
13. Leaf base orange red .... 16. *S. croceus.*
Leaf base not colored .... 14.
14. Margins of leaf base sharply serrate at shoulders, margins of blade triangular in section .... 17. *S. Gardneri.*
Margins of leaf base entire, margins of blade oval or flat in section ... 15.
15. Costa long-excurrent .... 13. *S. subulatus.*
Costa not excurrent .... 16.
16. Margins of leaf blade toothed, border cells short .... 14. *S. fallax.*
Margins of leaf blade entire, border cells elongate .... 15. *S. Mulleri.*

4. SYRRHOPODON REVOLUTUS Doz. & Molk. Plate 6, fig. 56.

Syrrhopodon revolutus DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1846) 60, *pl.* 62.

Pale-brown, glossy, fragile plants growing in compact tufts or cushions. Stems branched, up to 3 cm high. Leaves erect, closely imbricated, 1.5 to 2 mm long, ovate-lanceolate, rather abruptly short-acuminate, bordered from insertion nearly to apex with a narrow hyaline band of elongated cells; margins entire or with a few minute teeth near apex, strongly revolute from middle nearly to tip; costa slender, ending in or just below apex, smooth or lightly papillose on back above; cancellinæ extending upward along costa to within a short distance of apex; small, chlorophyllose cells short-rectangular, smooth, with firm, colorless walls, confined to a small area near apex in 4 or 5 rows on both sides of cancellinæ. Seta slender, smooth, 6 mm long; capsule erect, oblong-cylindric, urn 1 mm long; peristome teeth 16, yellowish, coarsely papillose; lid subulate-rostrate from a convex base, 1 mm long; calyptra covering urn; spores papillose, 15 µ.

LUZON, Benguet Subprovince, Baguio, *Williams 1826*. CATANDUANES, *Ramos 30610*.

Distribution: Madagascar, Annam, Sumatra, Java, Borneo.

The erect, closely imbricated leaves distinguish this species from all its allies except *S. borneensis*, which is separable through the coarsely papillose small apical leaf cells. The costa of *S. revolutus* is often lightly papillose on back above but never to the extent shown by *S. borneensis*, and the small upper cells are smooth and clearly defined.

5. SYRRHOPODON BORNEENSIS (Hampe) Jaeg. Plate 6, fig. 61.

Syrrhopodon borneensis (Hampe) JAEG., Adumbr. 1 (1871-1872) 316.
Trachymitrium borneense HAMPE, Nuov. Giorn. Bot. Ital. (1872) 280.

Similar in most respects to *S. revolutus*. Leaves usually more sharply acuminate and with margins less strongly revolute above; costa strongly papillose-tuberculate on back near apex; small chlorophyllose cells obscure, coarsely papillose.

LUZON, Laguna Province, San Antonio, *Ramos 16672*.

Distribution: Java, Borneo, Malay Peninsula.

The Philippine plants have been referred to var. *javense* Ren. & Card. but the distinctions between the type and the variety seem too slight and inconstant to prove of much practical value.

6. SYRRHOPODON RUFESCENS Hook. and Grev. Plate 6, fig. 58.

Syrrhopodon rufescens HOOK. and GREV., Brewster Edinb. Journ. Sci. 3 (1824) 227.

Greenish-brown, glossy plants with a rufous tinge, densely tufted. Stems up to 1.5 cm long, branched. Leaves erect-spreading with flexuose contorted points when dry, about 1.5 mm long, narrowly oblong-lanceolate, acuminate, carinate-concave, bordered all around with a narrow band of elongated hyaline cells; margins erect, entire; costa percurrent, smooth or minutely papillose on back above; cancellinæ extending about five sixths of way up the leaf; small chlorophyllose cells subquadrate, incrassate, papillose, occupying apical portion and extending about one-third of way down the leaf, in 6 or 7 rows at top of cancellinæ. Seta filiform, 6 to 7 mm long; capsule erect.

LUZON, Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16843.*

Distribution: Malay Peninsula, Java, Marianne Islands.

This species has a distinctly more shaggy appearance than *S. revolutus* due to the spreading, flexuose leaf points. Under the microscope it can be readily separated from *S. amoenus* by the entire leaf margins.

16. SYRRHOPODON AMOENUS Broth. Plate 6, fig. 13.

Syrrhopodon amoenus BROTH., Oefv. F. Vet.-Soc. Foerh. 42 (1899) 110.

Pale, greenish-brown plants with an iridescent sheen when dry, densely matted. Stems under 1 cm long, branched, weak and flexuose. Leaves crowded, with widely spreading flexuose points when dry, up to 2 mm long, narrowly ovate-lanceolate, acuminate, carinate-concave, with a narrow hyaline border of elongate cells all around; margins erect, spinose-serrate halfway down, entire below; costa percurrent, spinose on back in upper half; cancellinæ extending above midleaf and often three-fourths of the way up; small chlorophyllose cells dense, papillose, rounded-quadrate, not incrassate, in 6 to 8 rows near top of cancellinæ.

LUZON, Laguna Province, Mount Maquiling, *Robinson 17060; Bartlett 15757;* Tayabas Province, Baler, *Santos 855.* NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 29.* PANAY, Capiz Province, Libacao, *Martelino & Edaño 35771.*

Distribution: New Guinea, Queensland.

No. 17060, from Mount Maquiling, was determined by Brotherus as *S. confertus* Sull. var. *minor*, but as the costa is strongly spinose on the back it seems to belong here without much question.

5. **SYRRHOPODON TRISTICHUS** Nees. Plate 4, fig. 90.

Syrrhopodon tristichus Nees in Schwaegr. Suppl. 4 (1842) pl. 311.
Syrrhopodon macro-tristichus Broth., Leafl. Philip. Bot. 2 (1909) 652.

Slender plants, with elongated, branched stems up to 8 cm long, growing in loose, deep tufts, dull brownish green above, darker below. Leaves widely spreading from an erect, whitish, clasping base, well spaced, indistinctly 3-ranked, up to 10 mm long, abruptly narrowly ligulate above shoulders, bordered all around with a thickened, yellowish band of elongated cells in several layers; margins erect, spinose-serrate near apex and more distantly toothed at least halfway down; costa brownish, ending just below blunt apex, minutely denticulate on back above; upper lamina cells quadrate, incrassate, papillose, 5 to 6 μ wide; cancellinæ in 8 to 10 rows on each side of costa, truncate or obtusely angled above. Seta slender, 6 mm long; capsule ovoid-cylindric, glossy brown, urn 2 mm long.

LUZON, Rizal Province, *Loher 15164*: Bataan Province, Upper Lamao River, *Williams 840*: Tayabas Province, Lucban, *Elmer 7713*, a robust form: Camarines Sur Province, Mount Isarog, *Edaño 34218*. NEGROS, Negros Occidental Province, Mount Marapara, *Curran & Foxworthy 13645*; Cuerno de Negros, *Magdamo 40*.

Distribution: Ceylon, Sumatra, Java, Amboina, Borneo.

The elongate stems with distant, trifarious leaves widely spreading from the shoulders should locate this species with ease. *S. macro-tristichus* Broth. seems to be only a luxuriant form without any structural peculiarities.

6. **SYRRHOPODON ALBOVAGINATUS** Schwaegr. Plate 4, fig. 91.

Syrrhopodon albovaginatus Schwaegr., Suppl. 2 pt. 2 (1823) 112, pl. 113.

Smaller than *S. tristichus*, more deeply tinged with brown, with shorter, more crowded leaves. Stems about 1.5 cm high, simple or branched. Leaves ligulate from an erect, whitish, clasping base, transversely wrinkled in blade, blunt at apex, 3 or 4 mm long, with a strong, brownish, thickened border of elongate cells; margins erect and entire at base, recurved above and coarsely serrate, with paired teeth on roll of leaf; costa strong, brown, ending just below blunt, toothed apex, strongly toothed on back above; upper cells minute, short-rectangular, about 3 μ wide, incrassate, strongly papillose, especially on undulations; cancellinæ very lax and thin-walled, nearly as thick as wide, in 6 or 7 rows on each side of costa, extending upward along costa in rather acute angles. Seta slender, erect, 5 mm long; capsule erect, ovoid-cylindric, glossy, urn 1.5 mm long.

LUZON, Cagayan Province, Kilingkiling, *Edaño 79755*: Laguna Province, San Antonio, *Ramos 16670*; Mount Maquiling, *Elmer 18457*. MINDORO, Puerto Galera, *Bartlett 18567*. NEGROS, Occidental Negros Province, Fabrica, *Chapman 47*. PANAY, Capiz Province, Jamindan, *Ramos & Edaño 80840*; Libacao, *Martelino & Edaño 35768, 35770, 35779*. MINDANAO, Agusan Province, Agusan Valley, *Hutchinson 7605*. BILIRAN, *McGregor 18464*.

Distribution: Malay Peninsula, Borneo, Moluccas, New Guinea, Fiji.

Not likely to be confused with any other species but *S. tristichus*, from which it may readily be separated by the shorter, more strongly bordered and serrate leaves which are transversely wrinkled in the blade. The lamina is toothed on the ridges somewhat as in certain species of *Atrichum*.

7. SYRRHOPODON FLAMMEO-NERVIS C. M. Plate 4, fig. 82.

Syrrhopodon flammeo-nervis C. M., Linnaea 38 (1874) 557.

Small or fairly robust plants, densely tufted, dull yellowish green strongly tinged with brown. Stems 1 to 4 cm high, branched. Leaves crowded, up to 4 mm long, carinate-concave, linear-lanceolate from an erect, whitish base, more or less denticulate at extreme apex, otherwise entire, widely spreading from shoulders and slightly flexuose when dry, more rigidly erect-spreading when moist, bordered all around with a narrow hyaline band of elongate cells; costa percurrent or ending just below blunt apex, usually toothed on back near tip, reddish brown at insertion, paler above; upper cells rounded or oval, 8 to 12 μ in diameter, incrassate, papillose, often spinose in the apex, cancellinae in 5 or 6 rows on each side of costa, rounded above, ending near leaf shoulders.

LUZON, reg. montosa, *Wallis* (type); Laguna Province, Mount Maquiling, *Hedden 115*. NEGROS, Cuerno de Negros, *Magdamo 19*. PALAWAN, Mount Manasal, *Edaño 80869*.

Distribution: Borneo.

The plants from the type collection are smaller than any of the subsequent gatherings, but without any structural differences. Var. *robustus* Dix., from Borneo, seems to be an extreme form, with stems up to 7 cm long.

4. SYRRHOPODON BARTLETTI Bartram sp. nov. Plate 6, fig. 33.

Dense caespitosus. Caules brevi, circa 5 mm alti. Folia sicca contorta, oblongo-ligulata, brevissime acuminata, limbo hyalino integro ubique circumducta; costa percurrens; cellulæ superiores rotundatae, obscurae, papillosae, 8 ad 10 µ, cancellinae supra rotundatae.

Small, dull yellowish-green plants, densely tufted. Stems about 5 mm high. Leaves crowded, twisted and contorted when dry, more erect-spreading when moist, oblong-ligulate from a scarcely wider base, up to 2 mm long and 0.4 mm wide, abruptly short-acuminate, bordered all around with a narrow hyaline or yellowish band of elongate cells, comal leaves frequently with clusters of septate propagula on ventral face near costa; margins plane, entire; costa percurrent; lamina cells small, rounded, obscure, papillose, 8 to 10 µ in diameter, not incrassate, cancellinæ in 6 to 8 rows, rounded above, ending at top of short leaf base. Fruit unknown.

LUZON, Benguet Subprovince, Baguio, on pine trunk, *Bartlett 13331*.

Endemic.

Clearly related to *S. tjibodensis* Fleisch., but with shorter, more oblong leaves which are wider in the upper half and more abruptly pointed. The narrow marginal cells of the leaf base are usually colored and form a distinct yellowish border extending to the insertion.

5. SYRRHOPODON SEMPERI C. M. Plate 6, fig. 34.

Syrrhopodon Semperi C. M., Linnæa 38 (1874) 652.

Small plants, similar to *S. spiculosus* in most respects but with costa smooth on both sides. Leaves about 2.5 mm long, ligulate from an erect, slightly wider base, abruptly acute and indistinctly toothed at apex, hyaline border of elongate cells very narrow, ending some distance below apex, usually with a few short, spinelike teeth near leaf shoulders but often entire; costa smooth on both sides, ending just below apex; upper cells rounded, about 10 µ in diameter, coarsely papillose; cancellinæ ending in acute angles above. Fruit unknown.

LUZON, Tayabas Province, Baler, *Santos 556*; without locality, *Semper* (type).

Endemic.

The species is known only from these two gatherings. The plants from the type collection are in poor condition and scarcely adequate for satisfactory analysis, but the Santos specimen from Tayabas Province is apparently identical in every particular.

10. SYRRHOPODON SPICULOSUS Hook. & Grev. Plate 6, fig. 95.

Syrrhopodon spiculosus HOOK. & GREV., Brewster Edinb. Journ. 3 (1825) 226.

Slender plants, with flexuose, tomentose stems up to 3 cm long, yellowish green above, brown below, densely tufted. Leaves rather laxly imbricated, flexuose and spreading from an erect, whitish base when dry; ligulate from a slightly wider oblong base, apiculate, up to 3 mm long, with a narrow hyaline border of elongate cells extending about three-fourths of way up the leaf; margins more or less recurved and spinose-toothed for a short distance below apex, usually with a few sharp spinelike teeth near leaf shoulders; costa ending below blunt, toothed apex, spinose on both sides about halfway down; upper cells rounded, incrassate, 10 to 12 μ in diameter, coarsely papillose; cancellinae in 6 to 8 rows on each side of costa, acutely angled above.

PANAY, Capiz Province, *Edaño 46216*.

Distribution: Malay Peninsula, Sumatra, Borneo.

This plant is probably more closely allied to *S. ciliatus* than any of the other local species, but readily distinguished by the narrower leaf blade and the margins sparingly spinose-toothed near the leaf shoulders instead of long-ciliate.

11. SYRRHOPODON PHILIPPINENSIS Bartram sp. nov. Plate 6, fig. 96.

Pusillus, dense caespitosus. Folia ad 2 mm longa, sicca crispata, humida patentia, e basi oblonga, ligulata, concava, ad apicem apiculata; margines incurvi superne denticulati, superiore parte baseos longe ciliato-spinosi; costa e media basi usque ad apicem dorso et ventri ciliato-hispida; cellulae superiores hexagonae, haud incrassatae, papillosae. Caetera ignota.

Small, dull brownish-green plants in dense tufts. Stems up to 5 mm high. Leaves crowded, crispate with incurved points when dry, ligulate from a slightly wider oblong base, deeply concave above, up to 2 mm long, apex rounded and minutely apiculate; margins of blade broadly incurved, denticulate above, at leaf shoulders armed with 4 to 8 long, curved, spinelike cilia up to 8 μ long; costa ending in apiculus, spinose-hispid on both sides from about middle of base nearly or quite to apex; upper cells hexagonal, papillose, 8 to 10 μ in diameter, one or rarely 2 rows at margins narrow and hyaline, forming a very indistinct border ending well below apex; cancellinae in 4 to 6 rows on each side of costa, rounded above. Sporophyte unknown.

LUZON, Zambales Province, hills between San Marcelino and Mount Pinatubo, *Bartlett 14218*, *14219* (type), *14220*.

Endemic.

On rotten wood. This curious little plant is widely distinct from *S. spiculosus* and *S. Semperi* in the long, spinelike cilia of the leaf shoulders and the armature of the costa. The latter feature appears to be quite variable, but in every plant examined some of the leaves, and especially the lower ones, show the long spines on both sides of the costa often projecting halfway to the margins; they are more strongly developed below the middle of the blade than above.

12. SYRRHOPODON CILIATUS (Hook.) Schwaegr. Plate 6, fig. 37.

Syrrhopodon ciliatus (Hook.) SCHWAEGR., Suppl. 2 pt. 2 (1823) 114, *pl. 130.*

Weisia ciliata HOOK., Musc. Exot. (1818) *pl. 171.*

Small, yellowish-green, glossy plants, with simple or branched stems up to 1 cm high, growing in dense tufts or mats. Leaves crowded, oblong-ligulate from a scarcely wider base, short-acuminate, slightly concave, up to 2 mm long and 0.3 mm wide, long-ciliate on edges and on inner side of costa, with a narrow hyaline or yellowish border of elongate cells from just below apex to insertion; margins erect or incurved above, with 10 to 15 long, curved, unicellular, cilialike teeth up to 100 μ long; costa percurrent, smooth on back, distantly ciliate on inner side about halfway down; upper cells rounded-hexagonal, smooth, 10 to 12 μ in diameter, slightly incrassate; cancellinæ in 5 or 6 rows on each side of costa, extending upward in acute angles beyond midleaf. Seta slender, erect, 3 to 4 mm long; capsule ovoid-cylindric, glossy, urn 1 mm long.

MINDANAO, Agusan Province, *Weber 1329.*

Distribution: Sumatra, Java, Borneo, New Guinea.

A unique species recognized at a glance by the long-ciliate leaf margins.

13. SYRRHOPODON SUBULATUS Lac. Plate 6, fig. 38.

Syrrhopodon subulatus LAC., Sp. Nov. M. Archip. Ind. (1872) 5, *pl. 3a.*

Small, laxly tufted plants, dull yellowish green. Stems shorter than leaves, less than 5 mm long, slightly reddish tomentose. Leaves up to 12 to 14 mm long, abruptly linear-subulate from a short base, erect and slightly flexuose when dry; margins plane, distantly and minutely denticulate above; costa smooth, long-excurrent, ending in a sharp, subulate point; lamina cells short-rectangular or quadrate, rounded, incrassate, smooth, 10 to 12 μ in diameter, marginal rows not differentiated but often in several layers forming an irregular, thickened border; cancellinæ inconspicuous, in 4 to 6 rows on each side of costa, gradually merging with lamina cells. Seta slender, shorter than leaves; capsule ovoid-cylindric.

MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *M. S. Clemens* "A."

Distribution: Sumatra, Celebes, Borneo, New Guinea.

The Mindanao plants are scarcely typical, and are in poor condition for comparison. The leaves are mostly of an abnormal type, with smaller, less incrassate lamina cells and a more sharply defined cancellinæ group than in typical plants. Further collections are needed to definitely establish this species in the local flora.

14. SYRRHOPODON FALLAX Lac. Plate 6, fig. 99.

Syrrhopodon fallax LAC., Sp. Nov. M. Archip. Ind. (1872) 5, *pl.* 35.

Small, densely tufted, dull yellowish-green plants with short stems. Leaves crowded, with strongly curled and contorted tips when dry, more rigidly erect-spreading when moist, up to 6 mm long, gradually narrowed from a short, ovate base to a long, narrowly linear blade, acuminate at apex; margins thickened, minutely and distantly toothed about halfway down; costa smooth, ending in apex; lamina cells subquadrate, faintly papillose, about 10 μ in diameter, not elongate at margins but usually bistratose in 2 rows forming a distinct, thickened border; cancellinæ poorly defined, ending about one-third of way up leaf base and merging gradually with lamina cells above, in about 6 rows on each side of costa; seta 5 mm long; capsule narrowly ovoid-cylindric, urn 1.5 mm long.

MINDORO, Puerto Galera, *Bartlett 13773*. MINDANAO, Zamboanga Province, Sax River, *Williams 2389*.

Distribution: Borneo.

The golden-yellow color and the more strongly curled leaves when dry may serve to distinguish this species from *S. Mulleri* in the field. Under the microscope it is immediately separated by the short marginal cells of the leaf blade and the toothed margins.

15. SYRRHOPODON MULLERI (Doz. and Molk.) Lac. Plate 7, fig. 100.

Syrrhopodon Mulleri (DOZ. & MOLK.) LAC., Bryol. Jav. 2 (1870) 224.
Calymperidium Mulleri DOZ. & MOLK., Bryol. Jav. 1 (1856) 51.

Densely tufted, dull brownish-green plants. Stems short, normally only a few mm long. Leaves crowded, erect-spreading, fragile, up to 10 mm long or longer but usually shorter, narrowly linear from a short, slightly broader, ovate clasping base, bluntly or sharply acute at apex; margins entire except for a few teeth at tip; costa smooth, ending just below apex; lamina cells subrectangular, 6 to 8 µ in diameter, usually lightly papillose, several rows at margins more elongate, forming a well-defined thickened border extending almost to apex; cancellinæ in 6 to 8 rows on each side of costa, ending in acute angles above. Seta slender, up to 11 mm long; capsule ovoid-cylindric, urn 1 mm long.

LUZON, Laguna Province, *McGregor 23272*: Tayabas Province, Tagcanyan, *Foxworthy & Ramos 13079*; Baler, *Santos 244*: Boundary Nueva Ecija and Tayabas Provinces, *Santos 214* in part: Camarines Sur Province, Botol River, *Edaño 84260*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 15*. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens "A."* CATANDUANES, Santo Domingo River, *Ramos 30609*.

Distribution: Malaysia, New Guinea, Fiji, Samoa, Tahiti.

This species is usually described as having smooth lamina cells, but I find them constantly more or less papillose. The shape of the leaf apex and the length of the leaves and the setæ vary considerably within reasonable limits, but these characters do not seem to lend themselves to any definite classification.

14. SYRRHOPODON CROCEUS Mitt. Plate 1, fig. 10.

Syrrhopodon croceus MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 41.

Densely tufted plants, dull reddish brown. Stems up to 3 cm high, simple or dichotomously branched. Leaves up to 8 mm long, rigidly erect-spreading or slightly curved, from an erect, clasping, orange-red base narrowly linear, channeled, blunt at apex; margins of blade distantly serrate with short teeth frequently in pairs, toward leaf shoulders usually with a group of 4 to 6 strong, curved, hyaline teeth; costa strong, brownish, slightly papillose above, ending in blunt, toothed apex; lamina cells opaque, short-rectangular, with rounded ends, slightly incrassate, papillose, about 7 µ in diameter, toward margins narrowly rectangular, forming a thickened border extending from just above leaf shoulders nearly to apex; cancellinæ in about 6 rows on each side of costa, extending about one-third up leaf base and changing abruptly to thick-walled, orange-red cells above. Sporophyte not seen.

PANAY, Capiz Province, *Edaño 46303*; Libacao, *Martelino & Edaño 35779* in part. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 40:* Occidental Negros Province, Fabrica, *Chapman 48.*

Distribution: Ceylon, Malaysia, New Guinea, Solomon Islands, Fiji, Samoa.

A very distinct species in the highly colored leaf base and the salient curved marginal teeth above the leaf shoulders.

17. SYRRHOPODON GARDNERI (Hook.) Schwaegr. Plate 7, fig. 107.

Syrrhopodon Gardneri (HOOK.) SCHWAEGR., Suppl. 2 pt. 2 (1826) 110, *pl. 131.*

Calymperes Gardneri HOOK., Musc. Exot. (1818) *pl. 146.*

Syrrhopodon Currani BROTH., Philip. Journ. Sci. § C 5 (1910) 142.

Small, densely tufted dull-green or brownish plants. Stems up to 1 cm long. Leaves more or less incurved and contorted when dry, rigidly erect-spreading when moist, ligulate from a slightly wider, ovate base, channeled, blunt or minutely apiculate, 3.5 mm long; margins of leaf base sharply serrate at shoulders, denticulate below, in blade strongly serrate with paired teeth from a triangular thickened border extending almost to coarsely toothed apex; costa strong, brown, 75 µ wide below, ending just below apex, papillose on back and usually toothed near apex; lamina cells oval or rounded, 8 µ in diameter, strongly papillose on ventral surface; cancellinæ in about 10 rows on each side of costa, usually extending upward in acute angles. Seta erect, about 4 mm long; capsule ovoid-cylindric, glossy, urn 1.2 mm long.

LUZON, Benguet Subprovince, *Curran 15686, Williams 1806, Bartlett 13934, 13935, 13937a, 13939.*

Distribution: Himalayas, Ceylon, Siam, Java, Borneo.

I can find no characters by which *S. Currani* can be distinguished from *S. Gardneri.* Brotherus describes *S. Currani* as having the leaf border lamellate, but in reality it is triangular in section with the serrations along the outer edges. *S. Gardneri* has been recorded from Borneo and represents another element in the significant group of Himalayan species which in the mountains of Luzon.

29. Genus THYRIDIUM Mitt.

Thyridium MITT., Journ. Linn. Soc. Bot. (1868) 188 emend.; FLEISCH., Laubmfl. Java 1 (1900-1902) 223.

Primary stems creeping, branches erect. Leaves crowded, crispate when dry, oblong or lingulate from an erect, hyaline, sheathing base, with a broad, hyaline border of elongated cells extending well above middle; upper cells small, incrassate, papillose, sharply distinct from border and cancellinæ cells of leaf base. Seta terminal on secondary branches, slender, erect; capsule erect, oblong-cylindric; peristome teeth papillose; lid subulate-rostrate; calyptra cucullate.

Key to the species of Thyridium.

1. Leaves rounded, constricted below apex .... 2.
Leaves acute, not constricted below apex .... 3.
2. Leaves 3-ranked when moist, hyaline border up to 200 μ wide.
1. *T. constrictum.*
Leaves not 3-ranked, hyaline border less than 100 μ wide.... 2. *T. Wallisi.*
3. Erect branches under 1 cm, leaves less than 2 mm long.... 4. *T. flavum.*
Erect branches over 1 cm, leaves 3 to 4 mm long .... 3. *T. undulatum.*

1. THYRIDIUM CONSTRICTUM (Sull.) Mitt. Plate 7, fig. 101.

Thyridium constrictum (Sull.) Mitt., Journ. Linn. Soc. 10 (1868) 188.

Calymperes constrictum Sull., U. S. Expl. Exped. Musci (1859) 6.

Rather slender plants in dense, intricate mats, yellowish green, pale brown below, slightly glossy. Primary stems creeping, branches elongate, up to 3 cm long, laxly erect. Leaves crowded, incurved and crispate when dry, erect-spreading when moist and more or less distinctly 3-ranked, about 3 mm long, oblong or lingulate from a broad, clasping, hyaline base, carinate-concave with margins broadly inflexed and undulate, constricted below rounded or emarginate apex into a narrow, flaring throat, with a broad, hyaline band of elongate cells in 25 to 30 rows and up to 200 μ wide at broadest part, decreasing rapidly in width upward and ending near throat; margins minutely denticulate; costa ending below apex, minutely toothed on back near tip and often radiculose near end; cancellinæ rectangular in about 20 rows, narrower toward margins, sharply defined and broadly rounded above; lamina cells rounded-hexagonal, 10 μ in diameter, papillose. Perichætium large, inner leaves about 5 mm long, from a long sheathing base gradually narrowed to a linear, channeled point, slightly constricted below apex; seta slender, erect, dark brown, 7 to 8 mm long; capsule ovoid-cylindric, 2 mm long, gradually narrowed to mouth; peristome teeth 16, brownish, densely papillose; lid subulate rostrate, 1.5 mm long; calyptra large, covering capsule, scabrous above, lacerate at base, split more than halfway up on one side; spores 18 to 20 μ, minutely papillose.

LUZON, Tayabas Province, Mount Binuang, *Ramos & Edaño 28941*.

Distribution: Great Natunas, Sumatra, Borneo, Pacific islands to Hawaii.

This is a noteworthy collection, not only because it is a unique local record but also because the plants are in good fruiting condition. The sporophyte characters have not been described before as far as I know. The present species is readily separated from *T. Wallisi* by the more elongate, lax branches and the much broader hyaline leaf border.

2. THYRIDIUM WALLISI (C. M.) Fleisch. Plate 5, fig. 101.

Thyridium Wallisi (C. M.) FLEISCH., Laubmfl. Java 1 (1900–1902) 236.

Syrrhopodon Wallisi C. M., Linnæa 38 (1874) 555.

Rather small, densely branched plants in compact mats, yellowish above, pale brown beneath. Branches up to 1.5 cm long, erect, densely foliate and subjulaceous when dry, sharply pointed at tips. Leaves gradually narrowed from an erect, ovate, whitish base to a short, lingulate, subtubular point, incurved and very crispate when dry, more spreading and lightly curved when moist; about 2 mm long, often with clusters of ovoid, brown, septate gemmæ on inner face, broadly rounded and often emarginate at apex, slightly constricted into a more or less definite throat; hyaline border in 10 to 12 rows and 60 to 85 µ wide at broadest part, rapidly narrowed upward and ending near throat; margins minutely denticulate, inflexed in upper half; costa pale brown, smooth, ending below apex; lamina cells minute, 6 to 8 µ, irregular and angular, incrassate, papillose; cancellinæ in 8 to 10 rows, ending in broadly rounded or obtuse angles above. Perichætial leaves up to 4 mm long, convolute-sheathing below; seta 1 cm long, reddish brown; capsule erect, urn 2 mm long; peristome teeth short, densely papillose, deeply inserted; spores papillose, 20 to 25 µ.

LUZON, Bataan Province, Mount Mariveles, *Leiberg 1215*; Lamao River, *Williams 811*: Tayabas Province, Mauban, *Pastrana 53*; Guinayangan, *Doldulao 84421*. NEGROS, Occidental Negros Province, Cimagaan River, *Whitford 1572*; Cimagon River, *Copeland*. PANAY, Capiz Province, *Edaño 46854*.

Distribution: Malay Peninsula, Great Natunas, Borneo, Celebes.

According to a note accompanying *No. 84421*, cited above, this moss is gathered by people from the bark of apitong, yacal, lauan, and other *Dipterocarpus* species logged there, and is called *pang balot sa ugat ng pasdak*. The dense, compact mats hold water for at least a week and do away with the need of watering air plants daily.

1. **THYRIDIUM UNDULATUM** (Doz. & Molk.) Fleisch. Plate 7, fig. 105.

Thyridium undulatum (Doz. & Molk.) FLEISCH., Laubmfl. Java 1 (1900–1902) 230.
Codonoblepharum undulatum DOZ. & MOLK., Musc. Frond. Archip. Ind. (1849) 96, *pl.* 32b.

Robust, laxly tufted pale or yellowish-green plants. Stems creeping, branches erect, up to 1.5 cm long. Leaves incurved and undulate on edges when dry, widely spreading when moist, oblong-ovate from a scarcely wider, clasping base, 3 to 4 mm long, acute, with a hyaline border of elongate cells ending some distance below apex, 8 to 12 rows wide near leaf shoulders; margins erect, undulate, denticulate; costa ending just below apex; lamina cells hexagonal, 8 to 10 μ, papillose; cancellinæ cells numerous, rectangular, in 15 to 20 rows on each side of costa, changing abruptly to small lamina cells. Sporophyte not seen.

LUZON, Laguna Province, Mount Maquiling, *Herklots P. 29.* MINDORO, Lake Naujan, *Bartlett 13561.* NEGROS, Oriental Negros Province, Dumaguete, *Chapman 41.*

Distribution: Sumatra, Java, Celebes, Borneo, New Guinea.

On trees. Much larger than *T. flavum* in every way, but with the same structural details.

2. **THYRIDIUM FLAVUM** (C. M.) Fleisch. Plate 7, fig. 106.

Thyridium flavum (C. M.) FLEISCH., Laubmfl. Java 1 (1900–1902) 232.
Syrrhopodon flavus C. M., Bot. Zeit. (1855) 763.
Syrrhopodon luzonensis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 338.

Small plants growing in dense mats. Primary stems about 2 cm long, branches numerous, short, erect, about 5 mm long. Leaves crowded, incurved and crispate when dry, ovate-oblong from a short, clasping base, up to 2 mm long, acute, hyaline border 6 to 8 rows wide at broadest part, extending three-fourths up leaf; margins erect, strongly undulate, denticulate on bordered part; costa ending just below apex; cancellinæ rectangular, in 15 to 20 rows. Seta erect, 4 mm long; capsule erect, subcylindric, about 1 mm long; lid subulate-rostrate; calyptra cucullate, covering capsule, scabrous above.

DALUPIRI, Babuyan Group, *Bartlett 15843.* LUZON, Bataan Province, Lamao River, *Williams 824;* Olongapo Naval Reservation, *Bartlett 14114:* Cagayan Province, Sitio Babayuan, *Bartlett 14920, 14931.*

Distribution: Java.

The sporophyte characters of *S. luzonensis* are exactly those of *T. flavum*, and there are no differences of any importance in the leaf structure that I can see. The absence of any conspicuous flagelliform branches suggests that this may be the form referred to *T. cuspidatum* (Besch.) Fleisch. as represented by Fleischer's *Musc. Archip. Ind. No. 72*, but this plant is scarcely distinct from *T. flavum* as Fleischer has suggested.

30. Genus CALYMPERES Sw.

Calymperes Sw. in Schwaegr., Suppl. 1 pt. 2 (1816) 333.

Small to robust, mostly corticolous plants in tufts or compact cushions. Leaves crispate when dry, lanceolate or ligulate from a broader, whitish base; costa stout, usually percurrent, or excurrent in the abnormal leaves forming a thick point with apical clusters of propagula; lamina cells small, in one layer or frequently forming a narrow, thickened, serrate border, changing abruptly to lax, hyaline cancellinæ cells of leaf base, often with narrow, intramarginal bands of elongate cells (teniolæ) extending through leaf shoulders upward into blade. Seta short, erect; capsule subcylindric, erect; peristome none; calyptra campanulate, extending below capsule, plicate, often scabrous above, persistent; spores small.

Key to the species of Calymperes.

1. Leaves without teniolæ or a thickened border .... 2.
   Leaves with teniolæ or a thickened border .... 5.
2. Cancellinæ scalariform .... 4. *C. hyophilaceum.*
   Cancellinæ obovate, rounded above .... 3.
3. Leaf base broader than blade, costa without stereids .... 1. *C. Dozyanum.*
   Leaf base not or scarcely broader, costa with stereids .... 4.
4. Leaves linear, acute .... 3. *C. Clemensiae.*
   Leaves ovate, apex rounded .... 2. *C. tenerum.*
5. Leaf border and costa densely tuberculate .... 6. *C. tuberculosum.*
   Leaves not as above .... 6.
6. Leaves very long and narrow, much longer than stems .. 12. *C. serratum.*
   Leaves shorter than stems .... 7.
7. Leaf apex sharply acute .... 9. *C. salakense.*
   Leaf apex rounded or blunt .... 8.
8. Teniolæ none .... 11. *C. datense.*
   Teniolæ present .... 9.
9. Cancellinæ scalariform .... 5. *C. Semperi.*
   Cancellinæ rounded above .... 10.
10. Stems up to 4 cm high, leaves with a triangular thickened border.
   10. *C. tahitense.*
   Stems less than 1 cm high, leaf border not thickened .... 11.
11. Leaf base obovate, abruptly narrowed to blade .... 7. *C. moluccense.*
   Leaf base ovate, without shoulders, scarcely wider than blade.
   8. *C. Ramosii.*

1. CALYMPERES DOZYANUM Mitt. Plate 7, fig. 107.

Calymperes Dozyanum Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 42.

Resembling *C. hyophylaceum* but more robust; stems up to 1 cm high. Leaves with points strongly incurved and contorted when dry, erect-spreading when moist, up to 3 mm long, normal leaves lingulate from a broader base, concave, rounded at apex; margins of leaf base erect, minutely denticulate, usually inflexed above and minutely toothed toward apex; costa glossy on back when dry, ending below apex, papillose on back, in cross section showing several layers of lax, thin-walled cells on both sides of median guide row with surface layers differentiated; lamina cells small, dense, 4 to 8 µ, papillose, in one layer throughout; cancellinæ in 8 to 14 rows, large, short rectangular, in 2 layers near costa, progressively smaller and in one layer toward margins, usually broadly rounded above; teniolæ none. Abnormal leaves contracted to a proboscoid, gemmiferous apex. Seta 2 to 2.5 mm long; capsule cylindric, urn 1.5 mm long; lid conic-rostrate, half as long as urn; calyptra slightly scabrous above on edges of pleats.

LUZON, Bataan Province, Lamao River, *Williams 815*; Laguna Province, Mount Maquiling, *Bartlett 15667*; Zambales Province, Olongapo, *Ebalo 57*; Tayabas Province, Mauban, *Pastrana 26, 27, 39, 48, 59*.

Distribution: Ceylon, Sumatra, Java, Borneo.

A rather variable species in size and leaf form but usually quite distinct from *C. hyophylaceum* in the broader leaf base, the cancellinæ group broadly rounded above, and the homogeneous structure of the costa.

2. CALYMPERES TENERUM C. M. Plate 7, fig. 108.

Calymperes tenerum C. M., Linnaea (1871-1873) 144.

Small plants in dense, soft, extensive mats or cushions. Stems up to 1 cm high. Leaves incurved, crispate when dry, erect-spreading when moist, about 2 mm long, ovate-lanceolate from a short base, usually narrower than blade, rounded at apex; margins entire, irregularly inflexed above; costa strong, percurrent; lamina cells in one layer, irregularly rounded, 6 to 10 µ, lightly papillose; cancellinæ short-rectangular, gradually decreasing in size toward margins, sharply differentiated from lamina cells and ending abruptly below top of leaf base; teniolæ none. Seta 1.5 to 2 mm long; capsule cylindric, urn 1 mm long; lid short, conic-rostrate; calyptra minutely scabrous on edges of the pleats; spores up to 35 µ, papillose.

LUZON, Tayabas Province, Baler, *Santos 318*: Laguna Province, Lake Bunot, *Bartlett 15219, 15231*. CEBU, Alo, *Nemenzo 1*. LUMBACAN, on seashore, *Merrill 5279*.

Distribution: India, Malaysia, and the Pacific islands to Hawaii.

A species of wide distribution which is evidently uncommon locally. The habitat "on trees over beach, sea level" noted by Merrill, is typical of the species as I have seen it in Hawaii.

3. **CALYMPERES CLEMENSIAE** Broth. Plate 7, fig. 109.

Calymperes Clemensiae BROTH., Philip. Journ. Sci. § C 8 (1913) 69.

Rather robust, dull yellowish-green plants in extensive mats. Stems erect, simple or branched, radiculose below. Leaves crowded, incurved and twisted when dry, widely spreading when moist, up to 5 mm long, linear from a short, scarcely wider base, subtubulose above, bluntly acute; margins of blade broadly inflexed to near apex, minutely denticulate above and at leaf shoulders, otherwise entire; costa strong, yellowish, ending just below apex, minutely scabrous on back nearly to insertion; lamina cells rounded, 6 to 8 µ, slightly incrassate, mamillose on ventral surface, minutely papillose on dorsal side, becoming short-rectangular toward base and merging gradually with the poorly defined cancellinæ group of rectangular, hyaline cells which decrease gradually in size toward margins; teniolæ none. Seta reddish, 4 mm long; capsule cylindric, urn 1 mm long; lid conic-rostrate; calyptra as in *C. tenerum*.

MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens* "T."

Endemic.

This unique species is known only from the type collection. The linear leaves from a narrow base and the poorly defined group of cancellinæ cells are well-marked diagnostic characters.

4. **CALYMPERES HYOPHYLACEUM** C. M. Plate 7, fig. 110.

Calymperes hyophylaceum C. M. in Besch. Essai Calymp. Ann. Sci. Nat. (1895) 237.

Small plants with very short stems, laxly gregarious. Leaves with incurved points when dry, larger in comal tuft than below, normal leaves up to 2.5 mm long, ovate-lingulate from a narrow, clasping base, concave, apex rounded; margins erect or irregularly inflexed, minutely denticulate; costa ending below apex, papillose on back, in cross section showing bands of stereid cells on both sides of median guide row; lamina cells rounded, scarcely incrassate, papillose, 5 to 10 μ in diameter, in one layer throughout blade; cancellinæ in 8 to 10 rows, in two layers near costa, smaller toward margins, extending upward in acute angles along costa; teniolæ none. Abnormal leaves more oblong in outline, contracted toward apex in a proboscoid point bearing numerous fusiform, septate gemmæ.

LUZON, Rizal Province, Kay Ungulan, near Teresa, *Bartlett 15923a*. JOLO, Bud Kaunayan, *Bartlett 16115*.

Distribution: Sumatra, Java.

Apparently very rare and local. This species has been credited to the Philippines by Brotherus, but these two collections are all I have seen from the local area. Sharply distinguished by the scalariform cancellinæ and the lack of teniolæ.

6. CALYMPERES SEMPERI Hampe. Plate 1, fig. 11.

Calymperes Semperi HAMPE in Besch. Essai Calymp. Ann. Sci. Nat. (1895) 304.

Small, laxly tufted plants, deep green. Stems up to 6 mm high, radiculose below. Leaves incurved when dry, spreading when moist, up to 4 mm long, oblong-ligulate from a slightly wider, ovate base, rounded at apex, with a narrow, thickened, triangular border from just above leaf shoulders to near apex; margins denticulate all around; costa ending abruptly just below apex; lamina cells minute, rounded-hexagonal, 4 to 6 μ, papillose on dorsal side; teniolæ narrow, short but distinct, 6 or 7 rows of cells in from margins at leaf shoulders and merging with thickened border above; cancellinæ in 8 to 10 rows, distinctly scalariform, 25 μ wide near costa, smaller toward margins, changing abruptly to small lamina cells above. Abnormal leaves narrower with a proboscoid point; costa papillose on back.

BATAN, Mount Iraya, *Bartlett 15467a*. LUZON, Cagayan Province, Sitio Babayuan, *Bartlett 14924*: Rizal Province, Montalban, *Bartlett 14516, 14517*: Bataan Province, Lamao River, *Bartlett 14651*; Olongapo Naval Reservation, *Bartlett 14130*: Laguna Province, Mount Maquiling, *Herklots P. 80. c*, *Bartlett 15689*: Zambales Province, Olongapo, Ilingin Mountains, *Ebalo 68*; Mount Kabalan, *Ebalo 33* in part. CULION, between Culion and "Negative Barrio," *Bartlett 15551a*.

Endemic.

As described, *C. Semperi* has entire leaves, but as this is the only discrepancy between the above-cited collections and the original description it seems safe to refer them here provisionally. The species has never been recollected, to my knowledge, until the gatherings recorded here.

6. CALYMPERES TUBERCULOSUM (Dix. and Ther.) Broth. Plate 7, fig. 11.

Calymperes tuberculosum (Dix. and Ther.) BROTH., E. and P. Pflanzenfam. ed. 2 10 (1924) 240.

Syrrhopodon tuberculosus DIX. and THER., Journ. Linn. Soc. Bot. 43 (1916) 303.

Rather robust, rigid, dull green plants in dense tufts. Leaves suberect and slightly curved when dry, rigidly erect-spreading when moist, 4 to 5 mm long, linear-lanceolate from a slightly wider, ovate base, bordered from apex to leaf shoulders with closely spaced clusters of high, knoblike tubercles; margins of leaf base bluntly denticulate toward shoulders; costa tuberculate on both sides like leaf border to top of cancellinæ group; lamina cells minute, dense, quadrate-hexagonal, papillose; cancellinæ in 8 to 10 rows, in 2 layers near costa, ending in acute angles above; teniolæ 4 or 5 rows in from margins at leaf shoulders, merging with tuberculate border above and bordered below middle of leaf base with 3 or 4 rows of delicate rectangular hyaline cells, marginal row shorter and broader. Fruit unknown.

BATAN, Mount Iraya, *Bartlett 15464, 15465a.* LUZON, Nueva Ecija Province, Camp Martyr, Bongabong, *Santos 191:* Laguna Province, Mount Maquiling, *Bartlett 15615a.*

Distribution: Borneo, Fiji.

On tree trunks. This highly individual species will be recognized at a glance by the conspicuously tuberculate leaf border and costa. It is a fine addition to the local flora.

7. CALYMPERES MOLLUCENSE Schwaegr. Plate 7, fig. 12.

Calymperes molluccense SCHWAEGR., Suppl. 2 pt. 2 (1824) 99, *pl. 127.*

Densely tufted, yellowish-brown plants. Stems up to 1 cm long. Leaves incurved when dry, up to 3 mm long, abruptly contracted above short, obovate base to a concave, oblong-ligulate blade, blunt or rounded at apex; margins of blade inflexed, irregularly denticulate toward apex, basal margins erect, sharply serrulate at shoulders; costa ending just below apex or percurrent, papillose on back; lamina cells minute, dense, papillose, 5 to 7 μ, in one layer; cancellinæ group obovate, truncate or broadly rounded above and sharply defined from lamina cells, 4 or 5 rows toward costa large and lax, then abruptly smaller and narrower in 8 to 10 rows toward teniolæ; teniolæ distinct, in about 4 rows at leaf shoulders and extending upward in a narrow, intramarginal band which fades out about two-thirds up the blade. Abnormal leaves as in *C. Ramosii*. Fruit not seen.

LUZON, Bataan Province, Lamao River, *Williams 814*; Tayabas Province, Mauban, *Pastrana 2, 4, 31, 57, 62, 64*; Baler, *Santos 341*; Batangas Province, Wawa, *Santos 417*; Zambales Province, Mount Lobol, near Mount Kutoh, *Ebalo 8*. BOHOL, *Ramos 43427*.

Distribution: Moluccas, Fiji.

Most of these collections, and especially the Bohol specimen, agree so closely in every essential particular with plants from the original collection by Gaudichaud which I have seen that I have little hesitation in referring them here. The broad, obovate leaf base sharply contracted above the shoulders to the blade is a marked character.

Williams's *814* (labelled *C. Vriesii* Besch.) is doubtful. The cancellinæ group is obovate, as in *C. molluccense*, which seems to preclude any connection with *C. Vriesii*. The leaf base is typically contracted above the shoulders, but is longer in relation to the blade and the teniolæ in only 2 or 3 rows.

4. CALYMPERES RAMOSII Broth. Plate 7, fig. 114.

Calymperes Ramosii BROTH., Philip. Journ. Sci. 31 (1926) 281.

Small, densely tufted, dull plants, strongly tinged with brown. Stems up to 6 mm high. Leaves incurved and contorted when dry, up to 3 mm long, deeply concave, oblong-lingulate from a short, scarcely wider base, broadly rounded at apex; margins broadly inflexed, denticulate above; costa ending below apex, lightly papillose on back above; lamina cells rounded, not incrassate, lightly papillose, 7 to 10 μ, in one layer throughout; cancellinæ in about 10 rows, forming an obovate group; teniolæ short, indistinct, in about 4 rows near upper part of leaf base and extending only a short distance up blade. Abnormal leaves with costa strongly papillose, narrowly bordered above by lamina which is dilated at apex and tipped with a cluster of narrowly fusiform, septate gemmæ. Fruit unknown.

LUZON, Rizal Province, Mount Lumutan, *Ramos & Edaño 29824, 29825*; Bataan Province, Lamao River, *Williams 3137*.

Endemic.

Although closely allied to *C. molluccense*, this species seems to have a uniformly narrower leaf base which is not contracted to form definite shoulders; the lamina cells are larger and the cancellinæ group gradually decreases in size from the costa outward, in contrast to the 4 or 5 rows of large interior cells in *C. moluccense* which change abruptly to an area of smaller, narrower cells toward the teniolæ.

9. CALYMPERES SALAKENSE Besch. Plate 7, fig. 115.

Calymperes salakense BESCH., Ann. Sci. Nat. (Essai Calymp.) (1895) 302.

I have seen no plants from the Philippines that could be referred to this species, although it is recorded from there. The broadly lanceolate, sharply acute leaves, coarsely serrate in the apical portion, should distinguish it from any of the nearly related local species.

Distribution: Malakka, Java.

10. CALYMPERES TAHITENSE (Sull.) Mitt. Plate 7, fig. 116.

Calymperes tahitense (Sull.) MITT., Linn. Soc. Journ. Bot. (Samoa Mosses) (1868) 172.

Syrrhopodon tahitense SULL., U. S. Explor. Exped. Musci (1859) 6.

Calymperes orientale MITT. in Besch. Essai Calymp. Ann. Sci. Nat. (1895) 293.

Robust, dull-green or brownish plants, loosely tufted. Stems erect, simple or branched, up to 4 cm high. Leaves curved and contorted when dry, 6 mm long or longer, oblong-lanceolate from a short, scarcely wider base, concave, abruptly narrowed at apex to a short rounded point; margins of blade narrowly thickened to just below apex in a triangular border which is denticulate on edges above and entire below, basal margins not thickened, entire or minutely crenulate; costa 75 μ wide below, ending just below blunt, toothed apex; lamina cells minute, dense, finely papillose, 3 to 5 μ; cancellinæ in 12 to 15 rows, sharply differentiated from surrounding cells; teniolæ distinct in leaf base, 2 to 4 rows in from margins near shoulders and merging with border of blade. Abnormal leaves contracted to a longer, proboscoid point. Seta stout, 3 to 4 mm long; capsule ovoid-cylindric, urn 2 mm long, slightly contracted under mouth when mature; lid conic-rostrate, 0.8 mm long; spores coarsely papillose, 16 to 20 μ.

LUZON, Laguna Province, Mount Banahao, *Robinson 9805*: Tayabas Province, Mauban, *Pastrana 9*: Camarines Sur Province, Mount Potianay, *Edaño 84275*. POLILLO, Tugpan, *Robinson 9821*; *McGregor 10505*. MINDORO, Puerto Galera, *Bartlett 13772*. PANAY, Capiz Province, Libacao, *Martelino & Edaño*

35781. MINDANAO, Agusan Province, *Weber 1326*. BILIRAN, *McGregor 18459*.

Distribution: Java, Borneo, Fiji, Tahiti.

Easily recognized by the robust habit, the leaves with a thickened border extending nearly to the apex, and the distinct teniolæ in the leaf shoulders.

11. CALYMPERES DATENSE Bartram sp. nov. Plate 8, fig. 117.

C. hawaiiense Bartr. forsan affine; differt folia angustiore, costa dorso papillosa, margines argute serrati.

Dioicous; tall, relatively slender plants in loose tufts, dull green above, brownish below. Stems up to 5 cm high, simple or dichotomously branched, laxly foliate. Leaves erect and flexuose when dry, widely spreading and rigid when moist, up to 8 mm long, narrowly linear-lanceolate from a short, erect, oblong, whitish base, concave, gradually narrowed to a stout, rigid point, blunt at apex; margins of blade thickened to form a narrow, triangular border extending to apex, sharply serrated on edges, margins of leaf base sharply serrulate at shoulders; costa strong, 140 μ wide below, toothed on back in upper half, papillose below, ending just below blunt, toothed apex; lamina cells dense, rounded hexagonal, 6 to 10 μ, minutely papillose; cancellinæ in 10 to 12 rows, merging rather gradually with strongly incrassate cells just above; teniolæ none; marginal cells of leaf base small, short, incrassate. Fruit unknown.

LUZON, Benguet Subprovince, Mount Data, 8,000 feet, on tree, *F. C. Hadden 116*. NEGROS, Cuerno de Negros, *Magdamo 1, 12*.

This species will be separated from *C. tahitense* by the absence of teniolæ and the coarsely and sharply serrate leaves gradually narrowed to a stout, rigid point. It is probably near *C. hawaiiense* Bartr. but thoroughly distinct in the narrower leaf blade, the sharply toothed margins, and the costa dentate and papillose on the back.

12. CALYMPERES SERRATUM A. Br. Plate 8, fig. 118.

Calymperes serratum A. BR. in C. M. Syn. 1 (1849) 527.
Calymperes aeruginosum HAMPE, mss; Lac. Sp. Nov. M. Archip. Ind. (1872) 7.
Calymperes lorifolium MITT., Linn. Soc. Journ. Bot. (1869) 173.
Calymperes setifolium HAMPE, hb. Besch. Ann. Sci. Nat. (Essai Calymp.) (1895) 304.

Autoicous; loosely tufted, dull yellowish or golden-green plants tinged with brown. Stems very short, scarcely 1 mm long. Leaves numerous, erect with strongly circinnate points when dry, laxly erect and incurved when moist, up to 9 mm long, constricted above short, ovate base to a long, linear, channeled blade, gradually narrowed to a slender point which is often blunt and gemmiferous at tip; margins of blade narrowly thickened and serrate with paired teeth becoming stronger above, sharply serrulate and unistratose in leaf base; costa about 100 μ wide below, smooth, short-excurrent; lamina cells irregularly rounded and transversely oval, smooth, incrassate, 5 to 10 μ in diameter, at margins thickened to form a narrow triangular border which is toothed on edges; cancellinæ cells decreasing in size toward margins and not sharply defined from surrounding cells; teniolæ none. Seta reddish, 5 mm long; capsule cylindric, urn nearly 2 mm long; lid conic-rostrate; calyptra minutely serrulate above on edges of pleats; spores coarsely papillose, 12 to 15 μ.

LUZON, Bataan Province, Upper Lamao River, *Williams 816*: Laguna Province, Mount Maquiling, *Robinson 17121*, *Baker 2610*, *Bartlett 15776*, *15798*: Zambales Province, Pannubuan, *Bartlett 14211a*, *14235*. NEGROS, Occidental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 10387*.

Distribution: Malaysia, eastern China, New Caledonia, Fiji, Samoa.

Although this is a variable species in some respects, I doubt if the forms can be satisfactorily classified. The lamina cells are irregular in size and are often more uniformly transversely oval in some leaves than in others; but the variations in size and shape are frequently evident in different parts of the same leaf, so that this character can hardly be a distinctive one. The degree to which the cancellinæ cells are differentiated from the adjacent cells is not a tangible factor and is of little diagnostic value. I can see nothing in *C. lorifolium* Mitt. to separate it from *C. serratum* and *C. aeruginosum* Hampe, to judge from a meagre specimen in poor condition in the Fleischer herbarium, which is also without any distinctive characters. Fleischer's distinctions between *C. cristatum* and *C. serratum* are far from convincing, and it seems probable that a critical study of the group will further expand the list of synonyms.

7. Family POTTIACEÆ

Small or medium-sized, densely tufted plants, mostly rupestrine or terrestrial. Stems erect, usually branched. Leaves crowded, more or less crispate when dry; costa strong, excurrent or ending near apex; upper cells small, papillose, often obscure, basal cells larger, rectangular, frequently hyaline. Seta erect, elongate, smooth; capsule erect, cylindric or ovoid-cylindric, symmetrical;

lid conic-rostrate; peristome, when present, composed of 16 erect or spirally twisted teeth from a short basal membrane, entire or divided into 2 filiform, papillose forks; calyptra generally cucullate; spores small.

Key to the genera of Pottiaceæ.

1. Leaves with a thickened border .... 31. *Pachyneurum*.
Leaves not bordered .... 2.
2. Peristome none .... 3.
Peristome present .... 9.
3. Setæ lateral on stems .... 32. *Anoectangium*
Setæ terminal .... 4.
4. Leaves linear-lanceolate, acuminate .... 5.
Leaves spathulate or lingulate, broad .... 7.
5. Upper leaf cells mamillose on ventral side, smooth on back.
38. *Hymenostyliella*.
Upper leaf cells papillose .... 6.
6. Leaf margins involute .... 35. *Hymenostomum*.
Leaf margins erect or recurved .... 37. *Hymenostylium*.
7. Leaf margins strongly involute when dry .... 43. *Hyophila*.
Leaf margins erect when dry .... 8.
8. Leaves acute .... 33. *Merceyopsis*.
Leaves obtusely rounded .... 34. *Merceya*.
9. Upper leaf cells mamillose on upper side, in two layers.
42. *Timmiella*.
Upper cells papillose, in one layer .... 10.
10. Leaf base obovate, strongly sheathing .... 41. *Pseudosymblepharis*.
Leaf base ovate, not sheathing stem .... 11.
11. Peristome teeth spirally twisted .... 45. *Barbula*.
Peristome teeth erect .... 12.
12. Leaf margins recurved .... 44. *Didymodon*.
Leaf margins erect or involute .... 13.
13. Robust plants, peristome with basal membrane. 40. *Trichostomum*.
Small plants, peristome without a basal membrane .... 14.
14. Leaf margins involute .... 36. *Weisia*.
Leaf margins erect .... 39. *Rhamphidium*.

31. Genus PACHYNEURUM Bartram gen. nov.

Habitus Trichostomoideus. Folia e basi brevi linearia, acuminata, fragilia, incrassato-limbata. Costa pervalida, sectione transversa rotundata. Cellulae laminae subquadrata, densissime papillosae, basilares rectangulares, hyalinae. Fructus ignotus.

Plants with the habit of *Trichostomum*. Leaves fragile, linear from a short base, acuminate, with a narrow thickened border. Costa very strong, round in cross section. Lamina cells subquadrate, densely papillose, several rows at the margins in two or three layers; basal cells rectangular, hyaline. Sporophyte unknown.

PACHYNEURUM BARTLETTII Bartram sp. nov. Plate 9, fig. 119.

Sat robustum, dense caespitosum, sordide viride, haud nitidum. Caulis ad 1.5 cm altus, ramosus. Folia conferta, sicca flexuosa, apice circinato-incurvo, humida erecto-patentia, fragillima, e basi brevi, hyalina, longe linearia, acuminata, ad 5.5 mm longa et 0.2 mm lata; marginibus erectis, integris; costa pervalida, inferne circa 150 μ lata, dorso et ventri papillosa, in cuspidem brevem excurrens; cellulae basilares teneri, hyalini, rectangulares, superiores subquadratae, obscurae, densissime papillosae, marginales 3 stratosae, limbum angustum incrassatum instruentes.

Dioicous? Rather robust, dull-green, densely tufted plants. Stems up to 1.5 cm high, branched above, sparingly radiculose below. Leaves crowded, flexuose, with circinate points when dry, erect-spreading when moist, up to 5.5 mm long and 0.2 mm wide, linear from a short, hyaline, clasping base, acuminate, entire, canaliculate-concave; costa very stout, 150 μ wide below, excurrent in a short, cuspidate point, papillose on both sides from shoulders up, in cross section round, showing a median arc of 8 or 9 guide cells with thick bands of stereid cells on both sides, surface layers larger, well differentiated; basal cells rectangular, hyaline, with thin, delicate walls, abruptly smaller, subquadrate and chlorophyllose toward shoulders, upper cells very obscure, densely papillose, 6 to 8 μ in diameter, 2- or 3-stratose at margins in several rows forming a thickened border. Fruit unknown.

LUZON, Rizal Province, Montalban, *Bartlett 14592.*

Endemic.

Although without fruit these plants certainly represent a distinct generic concept characterized by the thick, round costa and the thickened leaf border. I have not seen *Barbula pachyloma* Broth., of New Guinea, but the illustration[3] suggests a similar leaf structure, although the habit of the plant and the leaf form are vastly different.

32. Genus ANOECTANGIUM (Hedw.) Bry. Eur.

Anoectangium (Hedw.) Bry. Eur., fasc. 29/30 (1846).

Anictangium Hedw., Sp. Musc. (1801) 40.

Small rupestrine plants growing in dense mats. Leaves narrow, crispate when dry; costa ending in or near apex; cells small, papillose, obscure. Setae lateral, slender, elongate; capsule small, erect; peristome none; calyptra cucullate.

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[3] Pflanzenfamilien 10 (1924) 280.

Key to the species of Anoectangium.

Leaves obtuse, mucronate, upper cells opaque.......................... 1. *A. euchloron.*
Leaves acute, upper cells pellucid, distinct .... 2. *A. subclarum.*

1. **ANOECTANGIUM EUCHLORON** (Schwaegr.) Mitt. Plate 8, fig. 120.

Anoectangium euchloron (Schwaegr.) MITT., Journ. Linn. Soc. 12 (1869) 176.

Gymnostomum euchloron SCHWAEGR., Suppl. 2 pt. 2 (1826) 83.

Dioicous; plants densely matted, dull yellowish-green above, brown below. Stems slender, erect, flexuose, simple or branched. Leaves spirally contorted and crispate when dry, spreading when moist, up to 1.25 mm long, oblong-ligulate, carinate-concave, obtuse, mucronate; margins erect, papillose-crenulate; costa scabrous on back, percurrent or ending just below apex; upper leaf cells 5 μ, densely papillose, obscure, opaque, incrassate, basal cells more pellucid and distinct, often elongate and rectangular near costa. Perichætial leaves acute; setæ lateral on stems, very slender, up to 6 mm long; capsule erect, ovoid-cylindric, urn 0.8 mm long; peristome none; lid subulate-rostrate; calyptra small; spores papillose, 10 to 12 μ.

LUZON, Benguet Subprovince, *Bacani 15085.*

Distribution: Wide; tropical America, Hawaii, Malaysia, Africa.

This fairly cosmopolitan species seems to be uncommon locally. The collection cited above is typical in all respects.

2. **ANOECTANGIUM SUBCLARUM** Broth. Plate 8, fig. 121.

Anoectangium subclarum BROTH., Philip. Journ. Sci. § C 3 (1908) 15.

Slender plants, but slightly more robust than *A. euchloron.* Leaves up to 1.4 mm long, linear-lanceolate, acute; leaf cells incrassate, papillose, more distinct and pellucid than in *A. euchloron.* Setæ up to 1 cm long.

LUZON, Benguet Subprovince, Rued Canyon, *Bartlett 13383, 13384, 13387, 13394;* Bugias, *Merrill 4901* (type), *7857;* Mount Pulog, *Curran, Merritt, & Zschokke 16400, 16418;* Baguio, *Bartlett 13360.*

Endemic.

Very distinct from *A. euchloron* in the acute leaves and more distinct, pellucid areolation.

33. Genus MERCYOPSIS Broth. and Dix.

Mercyopsis BROTH. & DIX., Journ. Bot. 48 (1910) 298.

Small, mostly rupestrine plants. Stems often interruptedly foliate. Leaves lingulate or subspathulate, crispate when dry; costa ending just below apex, in cross section showing a median row of guide cells; upper leaf cells quadrate-hexagonal, slightly incrassate, smooth, 5 to 8 µ wide, interior basal cells lax, short-rectangular. Seta slender, terminal; capsule erect, ovoid; peristome none; lid subulate-rostrate; spores small.

MERCYOPSIS MINUTA Broth. and Dix. var. SUBMINUTA (Broth.) Broth. and Dix. Plate 8, fig. 127.

Mercyopsis minuta Broth. & Dix. var. *subminuta* (Broth.) BROTH. & DIX., Journ. Bot. 48 (1910) 298.

Merceya subminuta BROTH., Philip. Journ. Sci. § C 5 (1910) 143.

Autoicous; slender, densely tufted plants, dull yellowish green above, pale brown below. Stems erect, branched, 1 to 1.5 cm high. Leaves incurved and strongly crispate when dry, erect-spreading when moist, about 2 mm long, spathulate or narrowly lingulate from a short base, acute; margins entire, narrowly recurved toward base, plane above; costa smooth, ending just below apex; upper cells rounded-quadrate, angular, smooth, rather incrassate, 5 to 8 µ, interior basal cells short-rectangular, pellucid, smaller and chlorophyllose toward margins. Seta slender, pale, 3 to 4 mm long; capsule erect, short-ovoid, pale brown, urn 0.8 mm long, exothecial cells lax, 15 to 35 µ wide.

LUZON, Benguet Subprovince, Kabayan, *Merrill 4908* (type); Baguio, *Robinson 14054*; *Bartlett 13967*; Kias Hill, *Williams 1633*. NEGROS, Mount Canlaon, *Curran 17384*.

Endemic.

The variety *subminuta* is supposed to be an endemic form distinguished by the smaller, firmer exothecial cells of the capsule, but as this character varies considerably toward the typical form, in the capsules I have examined I am doubtful if it can be satisfactorily maintained.

34. Genus MERCEYA Schimp.

Merceya SCHIMP., Syn. ed. 2 (1876) 852.

Dioicous; slender, tufted plants without lustre. Leaves crowded, lightly contorted when dry, narrowly spathulate, carinate-concave, apex obtusely rounded; margins recurved below;

costa strong, ending below apex, in cross section without a median row of guide cells; upper cells small, subquadrate, lower cells lax, rectangular. Seta terminal, slender; capsule erect, ovoid, thin-walled; peristome none.

MERCEYA BACANII Broth. Plate 8, fig. 173.

Merceya Bacanii BROTH., Philip. Journ. Sci. § C 5 (1910) 144.

Dioicous; slender plants in dense, soft tufts, dull yellowish green, fragile when dry. Stems erect, up to 1.5 cm high, simple, radiculose, below. Leaves shrunken and lightly contorted when dry, erect-spreading when moist, spathulate-ligulate, up to 3 mm long, apex rounded; margins entire, narrowly recurved below, plane and minutely crenulate above; upper cells irregularly quadrate, with firm walls, minutely papillose or smooth, 6 to 8 µ, several rows toward margins more incrassate but not forming a distinct border, basal cells rectangular, lax, hyaline or yellowish, extending upward along costa nearly or quite to midleaf, marginal rows near base much narrower. Seta yellowish, slender, 5 to 6 mm long; capsule ovoid, pale brown, urn 1 mm long, exothecial cells lax, up to 65 to 70 µ wide; lid conic-rostrate, oblique, 0.75 mm long; calyptra short, cucullate; spores smooth, pale, 8 to 10 µ.

LUZON, Benguet Subprovince, *Bacani 15942* (type); Baguio, on wet limestone, *Williams 1676*.

Endemic.

The sporophyte characters are described from Williams's *1676*, which is in good fruit.

35. Genus HYMENOSTOMUM R. Br.

Hymenostomum R. BR., Trans. Linn. Soc. 12 (1819) 573.

Small, densely tufted, terrestrial plants. Leaves linear-lanceolate, crispate when dry; margins involute; upper cells small, papillose, obscure, basal cells rectangular, hyaline. Seta erect, slender; capsule erect, ovoid; peristome none, capsule mouth closed with a very fragile membrane before maturity; lid rostrate, oblique; calyptra cucullate.

Distinguished from *Weisia* principally by the lack of a peristome.

HYMENOSTOMUM EDENTULUM (Mitt.) Besch. Plate 8, fig. 174.

Hymenostomum edentulum (Mitt.) BESCH., Bull. Soc. bot. fr. (1887) 95.

Weisia edentula MITT., Journ. Linn. Soc. Suppl. I (Musc. Ind. Or.) (1859) 27.

Autoicous; tufts dense, sordid green. Stems erect, usually branched, less than 1 cm high. Leaves crowded, curled when dry, erect-spreading when moist, linear-lanceolate from an erect, whitish base, bluntly pointed, up to 3 mm long; upper margins strongly involute; costa pale, excurrent in a short mucro; upper cells rounded-quadrate, densely papillose, 6 to 8 µ, basal cells hyaline, rectangular. Seta slender, yellowish, about 6 mm long; capsule ovoid, urn 1 mm long; peristome none; lid obliquely beaked; spores papillose, 15 to 18 µ.

LUZON, Rizal Province, Mount Lumutan, *Ramos & Edaño 20526*.

Distribution: India, Java, Tonkin, New Caledonia.

Difficult to separate from *Weisia controversa* unless in fruit; apparently infrequent locally.

36. Genus WEISIA Hedw.

Weisia HEDW., Sp. Musc. (1801) 64.

Small plants closely resembling *Hymenostomum* in the gametophyte characters but differing in the capsule with a simple peristome of 16 lanceolate, reddish teeth, deeply inserted below rim.

WEISIA CONTROVERSA Hedw. Plate 8, fig. 125.

Weisia controversa HEDW., Sp. Musc. (1801) 67.
Bryum viridulum LINN., Sp. Pl. 2 (1753) 1119.
Weisia viridula (L.) HEDW., Fund. II (1781) 90.
Weisia flavipes HOOK. f. & WILS., Flora of N. Z. 1 (1855) 59.

Autoicous; yellowish-green tufted plants. Stems about 5 mm high. Leaves strongly curled when dry, narrowly linear-lanceolate from a slightly wider, pale base, mucronate, about 2 mm long; margins narrowly involute above, erect at base; costa pale, up to 60 µ wide below, excurrent in a short mucro; upper cells rounded-quadrate, papillose, basal cells rectangular, hyaline. Seta slender, yellow, 4 to 8 mm long; capsule ovoid, urn 0.8 mm long; peristome teeth deeply inserted, reddish, papillose, up to 160 µ long; spores papillose, 15 to 18 µ.

LUZON, Nueva Viscaya Province, Mount Umugum, *Ramos 8280*.

Distribution: Cosmopolitan.

This familiar species is known locally only from a single collection. It is probably uncommon, but is a small, inconspicuous moss and easily overlooked.

37. Genus HYMENOSTYLIUM Brid.

Hymenostylium BRID., Bryol. Univ. 2 (1827) 81.

Slender, compactly tufted, rupestrine plants. Stems often elongated and radiculose, triangular in cross section. Leaves incurved and flexuose when dry, linear lanceolate, acuminate; costa usually ending just below apex; upper cells subquadrate, slightly papillose or smooth, basal cells rectangular. Seta slender, erect, smooth; capsule short, broadly ovoid, wide-mouthed; peristome none; lid with a long, oblique beak, often attached to columella and persistent; calyptra cucullate.

Key to the species of Hymenostylium.

Leaves 3-ranked .... 2. *H. inconspicuum.*
Leaves not 3 ranked .... 1. *H. recurvirostrum.*

1. HYMENOSTYLIUM RECURVIROSTRUM (Hedw.) Dix. Plate 9, fig. 126.

Hymenostylium recurvirostrum (Hedw.) DIX., Rev. Bryol. et Lichen. 6 (1933) 96.

Pottia curvirostris EHRH., Pl. Crypt. no. 93 in Beiträg. 1 (1787) 188.

Gymnostomum recurvirostrum HEDW., Sp. Musc. (1801) 33.

Dioicous; slender, rupestrine plants in compact tufts. Stems often elongate and abundantly radiculose, branched, laxly foliate, up to 5 cm long. Leaves frequently in interrupted tufts, flexuose and suberect when dry, widely spreading or recurved when moist, linear-lanceolate, acuminate, carinate-concave, up to 2 mm long; margin recurved on one side below; costa often papillose on back above, ending just below apex; upper cells subquadrate, incrassate, smooth or faintly papillose, 8 to 12 µ, pellucid and well defined, basal cells rectangular. Seta slender, 5 to 7 mm long; capsule wide-mouthed, glossy; peristome none; lid with an oblique, subulate-rostrate beak; spores papillose, 12 to 16 µ.

LUZON, Benguet Subprovince, Bued Canyon, *Bartlett 13392;* Baguio, *Williams 1074, 1077:* Rizal Province, Montalban, *Bartlett 14574, 14519:* Zambales Province, Mount Labal, near Mount Kutoh, *Ebalo 9, 10.*

Distribution: Wide; Europe, Asia, North America, New Zealand.

I can find no excuse for separating these plants from *H. recurvirostrum.* The trivial variations seem of minor importance and find a parallel in the European and American forms of this variable species.

The variety *luzonense* closely resembles var. *insignis* Dix. of the Scottish mountains. While a marked form, it seems to possess no distinctive characters apart from the subcylindric capsules which taper slightly, if at all, to the mouth when empty.

Williams's No. 1677 is recorded as *Gymnostomum rupestre* Schleich., but the recurved leaf margin, pellucid upper cells, and short, wide-mouthed capsules are all characteristic of *H. recurvirostrum*. The leaf cells in *Nos. 1674* and *13392* are very incrassate with angular lumens, but otherwise the plants are typical.

HYMENOSTYLIUM RECURVIROSTRUM (Hedw.) Dix. var. LUZONENSE (Broth.) Bartram comb. nov.

Hymenostylium luzonense BROTH., Philip. Journ. Sci. § C 5 (1910) 143.

Capsules oblong-cylindric.

LUZON, Benguet Subprovince, Bued River, *Merrill 4888*; Trinidad River, *Ramos 5518, 5519*; Baguio, *Robinson 14007*, *Bartlett 13337*.

2. HYMENOSTYLIUM INCONSPICUUM Griff. Plate 8, fig. 127.

Hymenostylium inconspicuum GRIFF., Not. (1849) 394.

Pale, golden-brown, glossy plants. Stems lax, elongate, branched, up to 7 cm long, laxly foliate, sparingly radiculose. Leaves 3-ranked, flexuose-spreading when dry, more rigidly squarrose-spreading when moist, 2.5 mm long, from a broadly ovate, concave base gradually narrowed to a slender, acuminate point, carinate above, decurrent at basal angles and contracted at insertion, with a distinct, pouchlike depression on each side of costa at widest part of leaf base; margins erect, entire; costa slender, ending in or just below apex; basal cells rectangular toward costa with incrassate, strongly porose lateral walls, much narrower toward margins, upper cells incrassate, smooth, rectangular, with irregularly thickened walls or subquadrate and angular, 8 to 12 μ wide. Sporophyte not seen.

LUZON, Benguet Subprovince, Baguio, on limestone walls, *Williams 1675*, *Baker 3853*.

Distribution: Himalayas, China.

The local collections are without fruit, but seem to agree in all the essential features with Salmon's detailed description.[1] No mention is made of the depression on each side of the leaf base in connection with the plants from India and China, but in the local specimens this feature is very obvious in some leaves and scarcely noticeable in others. When opportunity arises to compare the Philippine plants with these from continental Asia, it will be interesting to see if this peculiar character is common to the plants of both regions.

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[1] Journ. Linn. Soc. 34 (1861) 450.

38. Genus HYMENOSTYLIELLA Bartram gen. nov.

Sat robusta. Caulis erectis, superne fastigiato-ramosis. Folia lineari-lanceolata, concava, marginibus superne valde involutis; costa valida; cellulae superiores fortiter incrassatae, ventri mamillosae, dorso laeves. Fructus ignotus.

Rather robust plants. Stems erect, fastigiately branched above, radiculose throughout. Leaves linear-lanceolate, concave; margins inflexed above; costa strong; upper cells rounded, strongly incrassate, mamillose on ventral side, smooth on back. Sporophyte unknown.

HYMENOSTYLIELLA INVOLUTA (Card. & Ther.) Bartram comb. nov. Plate 8, fig. 128

Hymenostylium involutum CARD. & THER., Bull. Soc. Bot. Geneve 28 (1936) 82.

Barbula Llanosii C. M., in sched.

Timmiella Llanosii (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1902) 396.

Dioicous? Robust, densely tufted, yellowish-green plants. Stems 2 to 3 cm long, erect, branched, radiculose throughout. Leaves in crowded, interrupted tufts, erect with circinate points when dry, widely spreading when moist, linear-lanceolate, gradualy acuminate, canaliculate-concave, 4 to 5 mm long; margins inflexed and slightly repand in upper half, erect and entire below; costa very stout, up to 120 μ wide at base, tapering upward and percurrent; upper cells large, rounded, incrassate, mamillose on ventral side, smooth on back, 10 to 14 μ wide and 1 to 2 times as long, lumens angular or sinuose, basal cells narrowly rectangular or linear, pellucid, incrassate, lateral walls sinuose, several rows at margins very narrow. Sporophyte unknown.

Philippines, near the town of Calumpit, *Pater Llanos*. LUZON, Rizal Province, Montalban, *Bartlett 14375, 14393*.

Endemic.

This plant certainly has little or no connection with *Timmiella*. The large incrassate leaf cells in one layer suggest an entirely different affiliation. On the other hand the strongly circinate leaf points, the inflexed upper margins, and the highly incrassate, angular leaf cells, mamillose on the inner face and smooth on the back, are characters widely at variance with the accepted interpretation of *Hymenostylium*. Until fruiting plants are available the question must remain open, but it seems altogether probable that the species represents a distinct genus.

39. Genus RHAMPHIDIUM Mitt.

Rhamphidium MITT., Journ. Linn. Soc. 12 (1869) 45.

Dioicous; small, laxly tufted, terrestrial plants. Stems short. Leaves from a broad, clasping, oblong-ovate base abruptly contracted to a linear-lanceolate, grooved subula, entire or with a few faint teeth at extreme apex; margins erect; costa strong, brownish, percurrent; upper cells linear, incrassate, basal cells narrowly rectangular, pellucid. Seta erect, smooth; capsule erect, oblong-cylindric, peristome teeth 16, irregularly cleft, papillose; lid short, conic, obtuse; spores small.

RHAMPHIDIUM DIXONI Bartram sp. nov. Plate 8, fig. 179.

Caulis brevis, circa 5 mm altus. Folia e basi vaginante abrupte lineari-lanceolata, subulato-acuminata, subintegra; margines erecti; costa percurrens. Seta 1 cm longa; capsula oblongo-cylindrica, castanea, deoperculata, 2 mm longa; peristomii dentes brevi, papillosi, irregulariter divisi; operculum conicum, obtusum, 0.4 mm longum; annulus latus.

Small, dull yellowish-green laxly tufted plants, fragile when dry. Stems about 5 mm high, simple or innovating below perichætium. Leaves smaller below, upper about 2.5 mm long, from a broad, oblong-ovate, clasping base abruptly contracted to a rather short linear-lanceolate, grooved subula, slenderly acuminate; margins erect, entire or faintly denticulate at apex; costa brownish, percurrent; basal cells narrowly rectangular with thick, yellowish, pellucid walls, shorter and irregular toward the leaf shoulders, upper cells linear, incrassate, 5 μ wide and 4 to 6 times as long. Seta erect, reddish, 1 cm long; capsule erect, oblong-cylindric, urn 2 mm long, reddish brown, glossy; peristome teeth erect, narrow, scarcely 200 μ long, brownish, densely papillose, irregularly divided along the median line into 2 filiform forks; lid short, conic, obtuse, about 0.35 mm long; annulus large; spores papillose, 12 to 14 μ.

NEGROS, Canlaon Volcano, *Merrill 6814a* (type); *6816*, mixed with *Webera nutans*.

Endemic.

I am happy to associate the name of Mr. H. N. Dixon with this unique endemic species. It combines the leaf characters of *Dicranella* with a typical pottioid sporophyte. Although the short, fragile peristome teeth and the short, blunt lid are rather anomalous characters in this small but widely distributed genus, it seems to fit here without much violence to the generic concept.

40. Genus TRICHOSTOMUM Hedw.

Trichostomum Hedw., Sp. Musc. (1801) 107.

Dioicous; rather large, densely tufted plants. Leaves strongly curled when dry, linear-lanceolate from a short base, acuminate; margins erect, entire; costa stout, excurrent; upper leaf cells small, papillose, basal cells rectangular, pellucid. Seta erect, elongate, smooth; capsule cylindric; peristome teeth 16, erect, papillose, bifid or rudimentary; lid conic-rostrate.

Key to the species of Trichostomum.

1. Leaf base not bordered .... 1. *T. cuspidatum.*
   Leaf base bordered with narrow cells .... 2.
2. Leaf apex short, abruptly cuspidate .... 3. *T. subduriusculum.*
   Leaf apex long, finely subulate .... 2. *T. angustatum.*

1. TRICHOSTOMUM CUSPIDATUM Doz. and Molk. Plate 6, fig. 110.

Trichostomum cuspidatum Doz. & Molk., Bryol. Jav. 1 (1859) 96.

Trichostomum atrovirens Broth., Philip. Journ. Sci. 31 (1926) 282.

Densely tufted plants, yellowish-green above, dark brown below. Stems about 2 cm high, branched, laxly erect. Leaves circinate when dry, erect-spreading when moist, broadly linear-lanceolate from a short, concave base, carinate-concave, short-acuminate, up to 5 mm long and 0.5 mm wide; margins erect, subentire; costa brownish, 75 μ wide below, excurrent in a short, pale apiculus; upper cells rounded, minutely papillose, 8 to 10 μ, not at all incrassate, basal cells rectangular with thin, pellucid walls. Perichætial leaves similar to stem leaves but with a longer, more strongly clasping base; seta (immature) yellowish, up to 1 cm long.

Luzon, Rizal Province, Mount Susong-Dalaga, *Ramos & Edaño 29446*; Benguet Subprovince, Pauai, *Copeland 1323*.

Distribution: Java.

As far as the vegetative characters are concerned, these collections seem to represent only a robust form of *T. cuspidatum.* Unless the mature sporophyte proves to have distinctive features I do not see how the local plants can be separated. The plants are smaller than either of the other local species, and the leaves lack the border of narrow, pellucid cells extending above the leaf base.

1. TRICHOSTOMUM ANGUSTATUM (Mitt.) Fleisch. Plate 6, fig. 111.

Trichostomum angustatum (Mitt.) FLEISCH., Laubm. Java 1 (1900-1902) 338.

Tortula angustata MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 28.

Robust plants, densely tufted, yellowish above, reddish brown below. Stems erect, up to 6 cm long or longer, branched, radiculose. Leaves strongly circinate when dry, widely spreading with incurved, flexuose points when moist, up to 9 mm long, brittle, with points usually broken off, from a short, concave base very long linear-lanceolate, carinate-concave, gradually narrowed to a long, finely subulate point; margins erect; costa about 120 µ wide below, excurrent; upper cells rounded, dense, 5 to 6 µ, papillose, basal cells narrowly rectangular, incrassate, strongly porose, very narrow in several rows at margins and extending upward in a narrow, marginal border. Seta about 15 mm long; capsule cylindric; peristome short, from a low basal membrane, teeth pale, papillose, up to 0.12 mm long, irregularly cleft; spores papillose, 10 to 12 µ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13280*, *Clemens 51909*; Ifugao Subprovince, Mount Polis, *McGregor 20328*.

Distribution: India, Ceylon, Java, Celebes, southern China.

The Philippine plants are unusually robust, with leaves nearly 10 mm long, but are typical in all other respects.

2. TRICHOSTOMUM SUBDURIUSCULUM (C. M.) Broth. Plate 6, fig. 112.

Barbula subduriuscula C. M., Linnæa 4 (1874) 564.

Trichostomum subduriusculum (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1902) 394.

Robust plants in deep, dense tufts, yellowish and lustrous above, reddish brown below. Stems up to 5 cm high, branched, reddish tomentose. Leaves strongly contorted, often with circinate points when dry, about 5 mm long, not or scarcely brittle, linear-lanceolate from an erect, ovate, clasping base, abruptly cuspidate at tip; margins erect, entire; costa very strong, smooth, excurrent in a short, sharp, pale point; upper cells 8 µ, rounded, densely papillose, obscure, thin-walled; basal cells linear, incrassate, strongly porose, several rows at margins very narrow, forming an inconspicuous marginal band, 1 or 2 rows wide above and extending about one-third up the leaf. Seta slender, yellowish, about 16 mm long, capsule narrowly ovoid-cylindric, urn nearly 3 mm long; peristome very rudimentary, scarcely more than irregular lobes on edge of basal membrane extending 50 µ above rim; lid conic-rostrate; spores papillose, 12 to 15 µ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Hadden 117*, *Bartlett 13315*; Baguio, *Elmer 8488*, *Robinson 14010*, *Williams 1819*. PALAWAN, Mount Mantalsal, *Edaño 80880*. MINDANAO, Agusan Province, *Weber 1308, 1315, 1319, 1331*.

Endemic.

The bluntish cuspidate leaf apex and leathery leaves, rarely broken off at the points, will separate this species from *T. angustatum*. When well developed it is a fine, handsome plant.

41. Genus PSEUDOSYMBLEPHARIS Brotherus

Pseudosymblepharis BROTHERUS, E. & P. Pflanzenfam. ed. 2 10 (1924) 261.

Rather robust plants, with elongate, branched stems. Leaves circinate when dry, lanceolate from an obovate, strongly sheathing, pale base, acuminate; margins erect, entire; costa smooth, excurrent; basal cells linear, hyaline, smooth, upper cells small, subquadrate, papillose. Fruit unknown in the only Philippine species.

PSEUDOSYMBLEPHARIS PERVAGINATA (Broth.) Broth. Plate 8, fig. 133.

Pseudosymblepharis pervaginata (Broth.) BROTH., E. & P. Pflanzenfam. ed. 2 10 (1924) 261.

Trichostomum pervaginatum BROTH., Leafl. Philip. Bot. 6 (1913) 1978.

Dioicous; rather rigid, densely tufted plants, yellowish green above, pale brown below. Stems up to 6 cm long, laxly erect, branched, sparsely radiculose below. Leaves with brittle, circinate points when dry, spreading and incurved when moist, abruptly lanceolate-subulate from an erect, obovate, whitish, glossy, strongly sheathing base, carinate-concave above; margins erect, entire; costa 120 µ wide below, smooth, short-excurrent; basal cells linear, smooth, hyaline, much shorter, incrassate and pitted at shoulders, upper cells subquadrate, 5 to 7 µ, densely papillose, obscure.

MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11667*.

Endemic.

An attractive plant on account of the glossy, white, basal sheaths which show conspicuously between the leaves, especially in the dry state.

42. Genus TIMMIELLA (De Not.) Limpr.

Timmiella (De Not.) LIMPR., Laubm. 1 (1890) 590.
Trichostomum, Sect. *Timmiella* DE NOT., Cronaca bryol. ital. 1 (1866) 14.

Small, laxly tufted, terrestrial plants, dull yellowish green. Stems short, radiculose below. Leaves circinate when dry, oblong-lanceolate from a short, erect base, short pointed; margins erect or incurved, usually toothed above; costa broad, ending below apex; upper cells in 2 layers except at margins, mamillose on inner face, basal cells rectangular, hyaline. Seta elongate, erect; capsule erect or slightly curved, cylindric; peristome teeth 16 from a low basal membrane, bifid to base, forks filiform, papillose, slightly spiralled; lid conic-rostrate; calyptra cucullate.

TIMMIELLA MERRILLII Broth. Plate 5, fig. 116.

Timmiella Merrillii BROTH., Philip. Journ. Sci. 3 C 3 (1908) 14.

Dioicous; small plants in low, lax tufts. Stems up to 5 mm high, simple. Leaves erect-spreading when moist, slightly contracted above the short, concave base to a broadly linear-lanceolate, concave blade, short-acuminate, up to 5 mm long; margins erect or inflexed above, denticulate in upper half; costa about 200 µ wide below, tapering upward and ending just below apex; upper cells in 2 layers except at margins, mamillose on ventral side, 10 to 12 µ, basal cells subrectangular, hyaline. Seta 2 to 3 cm high, reddish; capsule erect or slightly curved, narrowed toward mouth, urn 3 mm long; peristome about 0.7 mm long, teeth divided to base into 2 filiform, reddish, densely papillose forks; annulus broad; lid 1 to 1.3 mm long; spores smooth, 12 to 15 µ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1820*: Baguio, *Merrill 4897* (type); Bued River, *Merrill 4890*.

Endemic.

The distribution of this genus is wide and the species are closely allied. The peculiar lamina structure with the cells in 2 layers except at the margins is a marked and unmistakable feature.

43. Genus HYOPHILA Brid.

Hyophila BRID., Bryol. Univ. 1 (1826) 760.

Dioicous; medium-sized plants in dense tufts or mats, usually on damp rocks. Leaves incurved and twisted when dry, oblong-lingulate, obtuse; margins involute, especially when dry, usually toothed toward apex; costa strong, percurrent or short-excurrent; basal cells rectangular, pellucid, upper cells small, papillose. Seta slender, elongate; capsule erect, cylindric; peristome none. Usually with clusters of chlorophyllose gemmæ at tips of branched filaments in axils of comal leaves.

Key to the species of Hyophila.

Leaves sinuate-toothed above, basal margins plane.............. 1. *H. involuta.*
Leaves entire, basal margins recurved.................................. 2. *H. rosea.*

1. **HYOPHILA INVOLUTA** (Hook.) Jaeg. Plate 7, fig. 135.

Hyophila involuta (Hook.) JAEG., Adumbr. 1 (1871–1872) 202.
Gymnostomum involutum HOOK., Musc. Exot. (1820) *pl.* 154.

Tufts dark green above, reddish brown below. Stems erect, 1 to 1.5 mm high, radiculose below, uniformly foliate. Leaves contorted when dry, widely spreading when moist, up to 3 mm long and a scant 1 mm wide, oblong-lingulate, concave, from a clasping base, blunt at apex; margins strongly involute when dry, erect or lightly inflexed when moist, denticulate toward apex; costa strong, tapering, smooth, percurrent; upper cells rounded, slightly incrassate, lightly papillose, basal cells rectangular, pellucid, shorter and subquadrate toward margins. Seta 1 to 1.6 cm high, red below, paler above; capsule cylindric, erect or slightly curved, urn 2 to 3 mm long; peristome none; annulus of one row of cells; lid conic-rostrate, 0.8 mm long; calyptra cucullate, extending nearly to base of urn, spirally twisted; spores smooth, 7 to 10 μ.

LUZON, numerous collections from scattered localities throughout the island.

Distribution: India, eastern China.

As a result of my inability to find a satisfactory method of classifying the Philippine collections referred to *H. Micholitzii* Broth., *H. flavipes* Broth., and *H. Dozy-Molkenboeri* (Doz. & Molk.) Fleisch. I cannot avoid the feeling that they are all, in reality, only forms of *H. involuta* (Hook.) Jaeg. Fleischer distinguishes *H. Micholitzii* from *H. Dozy-Molkenboeri* by the leaves broader above, yet the only specimen of *H. Micholitzii* from the Philippines, named by Brotherus, shows the leaf apex gradually narrowed to a rather sharp point. The usual diagnostic characters, such as the size and shape of the leaf and length of seta, have only a relative value and seem to be of minor importance as specific indicators. *H. flavipes* Broth. may prove to be a varietal form with the seta yellowish throughout.

HYOPHILA INVOLUTA (Hook.) Jaeg. var. **FLAVIPES** (Broth.) Bartram comb. nov.

Hyophila flavipes BROTH., Philip. Journ. Sci. § C 3 (1908) 14.

Seta pale yellow throughout.

LUZON, Benguet Subprovince, Ifugao Subprovince, *McGregor 20041*; Baguio, *Williams 1823*. BALUT, Davao Province, *Merrill 5425*. PANAY, Iloilo Province, *Robinson 18055*.

2. **HYOPHILA ROSEA** Williams. Plate 4, fig. 127.

Hyophila rosea WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 341.

Dioicous; in thin mats. Stems 1 to 1.5 cm high, radiculose below, with leaves often in interrupted tufts. Leaves strongly contorted when dry, widely spreading when moist, up to 3.5 mm long, oblong-ovate from a short, scarcely evident base, concave, acute; margins narrowly recurved below, erect above, minutely papillose-crenulate but not toothed; costa 100 μ wide below, often excurrent in a minute point, papillose on back about halfway down; cells rounded, slightly incrassate, 5 to 8 μ, papillose, gradually elongate and pellucid toward extreme base. Seta 1 cm long, reddish, paler above; capsule cylindric, urn 2 to 2.5 mm long; peristome none; annulus broad; lid 1 mm long; spores 12 to 14 μ.

LUZON, Bataan Province, Lamao River, *Williams 819*; Rizal Province, 8 miles east of Montalban, *Bartlett 14677*; Kay Ungulan, *Bartlett 15320*.

Endemic.

This species appears to be distinct, differing from any of the forms of *H. involuta* in the interrupted leaf tufts, the leaf margins recurved below, the papillose-crenulate margins, and the costa scabrous on the back.

44. Genus DIDYMODON Hedw.

Didymodon HEDW., Sp. Musc. (1801) 104.

Slender, densely tufted plants with branched stems. Leaves with incurved, contorted points when dry, narrowly lanceolate from a broader, suberect, pale base; margins more or less revolute; costa ending in or near apex; basal cells rectangular, hyaline or pellucid, upper cells small, dense, papillose. Seta elongate, erect; capsule erect, cylindric; peristome teeth 16, erect, from a low basal membrane, usually bifid to base, papillose; lid conic-rostrate.

DIDYMODON LUZONENSIS Bartram sp. nov. Plate 9, fig. 137.

Caespites densi, fusco-virides. Caulis 1 to 1.6 cm altus, gracilis. Folia sicca flexuosa et contorta, 1.5 mm longa, e basi pallida, oblonga anguste lanceolata, acuta vel minute apiculata; marginibus integris, medio valde revolutis, superne erectis; costa valida, fusca, infra apicem evanida; cellulae superiores rotundatae, 5 ad 7 µ, dense papillosae, basilares rectangulares, laevissimae, pellucidae, parietibus incrassatis lutescentibus. Seta circa 1.5 cm longa, rubella; theca erecta, cylindrica, deoperculata, 2 mm longa; annulus latus; peristomium pallidum, dentibus usque ad basin in 2 crura, valde papillosa, divisis; spori papillosi, 12 ad 15 µ.

Slender plants, with branched stems in dense tufts, brownish green. Leaves contorted when dry, rigidly spreading when moist, about 1.5 mm long, narrowly lanceolate from a short, pale, oblong base, acute or blunt and minutely hyaline-apiculate; margins entire, recurved near middle, erect above; costa strong, brownish, 60 to 70 µ wide below, ending just below apex, papillose on both sides; basal cells rectangular, smooth, with thick yellowish walls, upper cells rounded, 5 to 7 µ, densely papillose, obscure. Seta red, about 1.5 cm long; capsule erect, cylindric, urn 2 mm long; peristome teeth pale, divided to base into 2 filiform, densely papillose forks about 200 µ long; annulus broad; spores papillose, 12 to 15 µ.

LUZON, Benguet Subprovince, Mount Santo Tomas, on rock, *Bartlett 18304*.

Endemic.

A new genus to the Philippines and a unique species characterized by the short, entire leaves and the margins revolute only near the shoulders.

45. Genus BARBULA Hedw.

Barbula HEDW., Sp. Musc. (1801) 115.

Slender, tufted plants usually tinged with brown. Leaves lanceolate or ligulate, contorted when dry; costa percurrent or short-excurrent; basal cells rectangular, not sharply differentiated from the lamina cells which are usually small, rounded or subquadrate, and papillose. Capsules erect, cylindric, on slender, elongate setæ; peristome teeth 16 from a short basal membrane, spirally twisted, divided to base; lid conic-rostrate; calyptra cucullate; spores small.

Key to the species of Barbula.

1. Leaves hair-pointed .... 9. *B. pilifera.*
   Leaves not hair-pointed .... 2.
2. Peristome teeth oblique, scarcely twisted.................... 3. *B. indica.*
   Peristome teeth spirally twisted.................... 3.
3. Costa corrugated on back .... 4.
   Costa smooth on back.................... 8.
4. Upper leaf cells distinct, pellucid.................... 8. *B. pseudo-Ehrenbergii.*
   Upper leaf cells obscure, densely papillose.................... 5.
5. Leaf margins erect .... 6.
   Leaf margins recurved .... 7.
6. Leaf apex rounded .... 6. *B. javanica.*
   Leaf apex pointed .... 5. *B. consanguinea.*
7. Leaf apex acute .... 7. *B. lohoyrtensis.*
   Leaf apex mucronate .... 4. *B. obscuriretis.*
8. Leaf cells smooth ....1. *B. subulata.*
   Leaf cells papillose .... 2. *B. constricta.*

1. **BARBULA SUBULATA** Broth. Plate 7, fig. 139.

Barbula subulata BROTH., Philip. Journ. Sci. 31 (1926) 282.

Small, slender, laxly tufted plants, dull yellowish green. Stems erect, 1 to 2 cm high. Leaves erect and slightly twisted when dry, erect-spreading when moist, 1.5 to 2 mm long, from a triangular base gradually tapering to a long subulate point, carinate-concave; margins narrowly recurved, entire or with a few teeth at extreme apex; costa strong, brown, smooth on back, percurrent or short-excurrent; cells smooth, pellucid, moderately incrassate, upper subquadrate, 4 to 6 μ wide, gradually larger below, basal cells rectangular. Seta slender, reddish, 1 to 1.5 cm long; capsule erect, oblong cylindric, urn 1 to 1.5 long; peristome teeth long, tightly spirally twisted.

LUZON, Bontoc Subprovince, *Ramos & Edaño 38268* (type); Bauco, *Vanoverbergh 1767.*

Endemic.

The more slenderly pointed leaves of different shape will separate this species from *B. constricta.*

2. **BARBULA CONSTRICTA** Mitt. Plate 9, fig. 149.

Barbula constricta MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 33.

Dioicous; slender, densely tufted plants, dull green tinged with brown. Stems up to 3 cm long or longer, branched, flexuose, laxly erect. Leaves erect, flexuose and curved when dry, more rigid when moist, 1.5 mm long, lanceolate from a broadly ovate base, constricted to insertion, carinate-concave, short-acuminate; margins entire, narrowly recurved below, erect above; costa strong, percurrent, smooth on back; upper cells rounded or transversely oval, incrassate, papillose, 8 to 10 µ, basal cells pellucid, short-rectangular near costa and quadrate toward margins. Seta about 1 cm long, reddish; capsule oblong-cylindric; peristome teeth spirally twisted.

LUZON, Benguet Subprovince, Mount Data, *Hadden*: Baguio, *Williams 1826, Bartlett 13358*.

Distribution: Himalayas.

This and the preceding species differ from all their local allies in the acuminate leaf points and the smooth costa. The disconnected geographical distribution is suggestive of the generous representation of Himalayan elements in the mountain areas of Luzon.

5. BARBULA INDICA (Schwaegr.) Brid. Plate 3, fig. 110.

Barbula indica (Schwaegr.) BRID., Bryol. Univ. 1 (1826) 544.

Trichostomum indicum SCHWAEGR., Suppl. I 1 (1811) 142, *pl.* 36.

Small, slender plants in low tufts, dull yellowish green. Stems averaging about 1 cm high, laxly foliate. Leaves incurved and contorted when dry, erect when moist, up to 1.5 mm long, ovate-lanceolate, carinate, bluntly acute or obtuse, usually with a distinct plica on each side of costa; margins papillose-crenulate, narrowly recurved below, usually erect above; costa excurrent in a minute hyaline apiculus, corrugated on back; upper cells minute, rounded, 5 to 7 µ, obscure and densely papillose; basal cells rectangular, rather incrassate, smooth, pellucid. Seta slender, 5 to 6 mm long; lid sharply conic, 0.5 mm long, annulus none; peristome teeth from a short basal membrane, slightly oblique, not twisted, 0.3 to 0.4 mm long, reddish, densely papillose; spores smooth, 8 to 10 µ.

DALUPIRI, Babuyan Group, *Bartlett 15118, 15178, 15179*. LUZON, Ilocos Norte Province, Currimao, *Bartlett 14817, 14818, 14821*: Rizal Province, Tanay, *Robinson 11882*; Barrio de Antipolo, *Bartlett 15230*: Mountain Province, Bued Canyon, *Bartlett 13980*: Bontoc Subprovince, *Vanoverbergh 1906*: Batangas Province, Wawa, *Santos 412, 413, 414*: Laguna Province, Mount Maquiling, *Robinson 17138, 17140*: Manila, on walls, *Robinson 18274, Williams 2071, Merrill 9901, Bartlett 16219, 16223*: Cavite Province, Silang and Balete, *Bartlett 14765, 14768, 14771*: Tayabas Province, Lucban, *Pastrana 91*. PANAY, Iloilo Province, *Robinson 18146.* CEBU, Guadalupe, *Nemenzo 2.* BALABAC, *Mangubat 528.*

Distribution: India, Ceylon, Java, Borneo, eastern China.

A species of wide distribution, which seems to find a congenial habitat on city walls. The short leaves, strongly corrugated on the back of the costa and the nearly erect peristome teeth are good diagnostic characters.

4. **BARBULA OBSCURIRETIS** Dix. Plate 9, fig. 141.

Barbula obscuriretis DIX., Journ. Siam Soc. 9 (1932) 18.

Slender, dull-green plants. Stems 2 to 2.5 cm long, erect. Leaves spirally contorted when dry, 2 mm long, ligulate from an ovate base, obtuse, mucronate; margins narrowly recurved below, usually erect above middle; costa strong, excurrent in a minute mucro, corrugated on back more than halfway down; upper cells minute, obscure, densely papillose, basal cells pellucid, rectangular or linear, incrassate. Seta red, 10 to 12 mm long; capsule erect; peristome teeth twisted, nearly as long as urn.

LUZON, Rizal Province, Montalban, *Baker 6350:* Cagayan Province, Sito Babayuan, *Bartlett 14001, 14003.*

Distribution: Siam.

Not unlike *B. indica* in vegetative characters but more robust and quite distinct in the long, twisted peristome teeth. Possibly a form of *B. consanguinea.*

5. **BARBULA CONSANGUINEA** (Thw. and Mitt.) Jaeg. Plate 9, fig. 142.

Barbula consanguinea (Thw. & Mitt.) JAEG., Adumbr. 2 (1877–1878) 673.

Tortula consanguinea THW. & MITT., Journ. Linn. Soc. (1872) 300.

? *Barbula Edanoi* BROTH., Philip. Journ. Sci. 31 (1926) 282.

Dioicous; slender plants, dull yellowish green. Stems up to 2 cm high, laxly matted together with radicles below. Leaves contorted when dry, erect-spreading with incurved points when moist, 2 to 2.5 mm long, oblong-lanceolate, carinate, obtuse, mucronate; margins plane or slightly recurved on one or both sides below, erect above; costa pale, rough on back, excurrent in a short mucro; upper cells papillose, obscure, subquadrate, 6 to 8 µ, basal cells hyaline, smooth, short-rectangular, with firm, pale walls. Seta slender, up to 14 mm long; capsule cylindric, erect, urn 1.8 mm long, pale brown; lid 1 mm long, finely subulate-rostrate; peristome teeth spirally twisted in several turns; spores smooth, 10 to 12 µ.

LUZON, Rizal Province, Bosoboso, *Ramos 1166*; Bontoc Subprovince, *Ramos & Edaño 38267*; Ilocos Norte Province, Bangui, *Ramos 27778*; Pangasinan Province, Umingan, *Otanes 18357*; Labrador, Mount San Isidro, *Fenix 30138*; near Dagupan, *Williams 1824*.

These collections have the following characters in common: the leaves are longer than in *B. indica*; the margins plane or nearly so; the costa rough on the back and the peristome teeth spirally twisted in several turns.

B. Edanoi Broth. is described as having the costa smooth, but it is actually papillose on the back. This character, together with the obscure, papillose upper cells, brings the species very close to *B. consanguinea*. As the plants are sterile, eroded, and in poor condition, it seems unprofitable to maintain the species as a distinct concept.

6. BARBULA JAVANICA Doz. and Molk. Plate 9, fig. 143.

Barbula javanica DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1845) 47, *pl. 18*.

Dioicous; plants small, tufted, yellowish green. Stems up to 1 cm high, erect. Leaves erect and lightly curved when dry, about 1.5 mm long, lingulate, apex rounded; margins entire, plane; costa ending below apex, usually rough on back above; leaf cells pellucid and distinct, the upper quadrate with firm, pale walls, smooth or slightly papillose, 6 to 8 μ, gradually larger below, basal cells rectangular, hyaline. Seta slender, reddish, 8 to 10 mm long; capsule cylindric; peristome long, reddish, teeth spirally twisted.

LUZON, Batangas Province, Taal Volcano, *Ramos 29250*; Zambales Province, Olongapo, *Ebalo 40, 64, 65, 69*.

Distribution: Himalayas, Ceylon, Sumatra, Java, Celebes.

The small size, rounded leaf apices, and nearly smooth upper leaf cells, are good distinguishing characters. *B. javanica* and *B. pseudo-Ehrenbergii* may be included in the section *Hydrogonium*, but *B. lobayetensis* is more naturally allied to the species grouped in section *Helicopogon*.

7. BARBULA LOBAYETENSIS Williams. Plate 9, fig. 144.

Barbula lobayetensis WILLIAMS, Bull. Torr. Bot. Club 42 (1915) 573.

Dioicous; laxly tufted plants up to 1.5 cm high. Leaves incurved and contorted when dry, narrowly oblong-lanceolate, carinate-concave, apex acute or blunt; margins narrowly recurved below, erect above and often minutely denticulate near apex;

costa percurrent, scabrous on back above; upper cells subquadrate, 5 to 7 μ, papillose, larger near costa, basal cells rectangular, hyaline. Seta up to 1 cm long; capsule cylindric, urn 1.5 mm long; peristome teeth spirally twisted.

DALUPIRI, *Bartlett 15177.* LUZON, Batangas Province, Taal Volcano, *Merrill 10608:* Mountain Province, Bued Canyon, *Bartlett 13408;* Rizal Province, Hinulugan Taktak (waterfall), *Bartlett 15254, 15273;* Barrio de Antipolo, *Bartlett 15235;* Montalban, *Bartlett 14670, 14673, 14677:* Bulacan Province, Kay Tianak, *Bartlett 14695, 14747, 14750:* Tayabas Province, Lobayet, *Leiberg 1258* (type); Mauban, Barrio Balabago, *Pastrana 14.* PANAY, Iloilo Province, *Robinson 18052.* CEBU, Cebu, *Nemenzo 4.*

Endemic.

The collections grouped here form a rather composite series distinguished from *B. pseudo-Ehrenbergii* by the less robust habit, smaller and more papillose upper leaf cells, and the percurrent costa. The recurved margins will separate it from *B. inflexa* (Dub.) C. M. which, as I understand the plants, does not occur in the Philippines.

A larger series of specimens in good fruiting condition may result in a considerable modification of the treatment of the local species.

4. BARBULA PSEUDO-EHRENBERGII Fleisch. Plate 5, fig. 143.

Barbula pseudo-Ehrenbergii FLEISCH., Laubmfl. Java 1 (1900–1902) 356.

Dioicous; robust plants, bright green above, tinged with brown below and encrusted with a calcareous deposit. Stems erect, up to 4 cm high. Leaves incurved and contorted when dry, laxly spreading when moist, 2 to 2.5 mm long, oblong-lanceolate, obtuse or bluntly acute and more or less cucullate at apex; margins narrowly recurved below; costa ending just below apex, scabrous on back above; upper cells subquadrate, 8 to 12 μ wide, lightly papillose, with firm, pale walls, very clear and distinct, basal cells rectangular, hyaline.

LUZON, Ilocos Sur Province, Barrio Nagsapawan, *Bartlett 14288, 14289, 14292:* Rizal Province, Montalban, *Bartlett 14967:* Mountain Province, Bued Canyon, *Bartlett 13838.* CEBU, Cebu, Camp 4, *Nemenzo 5.*

Distribution: Java.

These plants are very similar to Fleischer's *Musc. Archip. Ind. No. 161* but doubtfully distinct from *B. Ehrenbergii* (Lor.) which seems to be a polymorphic species with a wide distribution including Europe, northern Africa, North America, and Asia. It is often found in the vicinity of calcareous springs.

9. BARBULA PILIFERA (Hook.) Brid. Plate 9, fig. 156.

Barbula pilifera (Hook.) BRID., Bryol. Univ. 1 (1826) 672.
Tortula pilifera HOOK., Musc. Exot. (1818) *pl. 12.*

Dioicous: rather robust, rigid, brownish-green plants. Stems erect, 1.5 to 2 cm long, densely foliate. Leaves erect and more or less spirally contorted when dry, widely spreading when moist, oblong-lanceolate from a broader, ovate base, carinate-concave, abruptly rounded at apex, up to 3.5 mm long, tipped with a long, smooth hairpoint which is hyaline at tip; margins strongly revolute from just below apex nearly to base; costa excurrent in hairpoint which is up to 0.7 mm long. Perichætial leaves convolute-sheathing, acuminate; seta 12 to 14 mm long; capsule cylindric, urn 2 mm long; peristome teeth from a low basal membrane, spirally twisted.

LUZON, Manila, collector unknown.

Distribution: Africa, Java, Chile.

Until rediscovered, this species will remain a questionable element in the local flora. It is so radically different from the other species that it will be recognized at a glance.

2. Subtribe DIPLOLEPIDEÆ

Peristome when present normally double, teeth mostly entire, composed of two layers of plates; outer plates divided by a fine zigzag median line or with a median furrow; inner plates not divided. Inner peristome, when present, pale and membranous; consisting of a more or less highly developed basal membrane, normally bearing 16 keeled segments alternating with the teeth, with or without intermediate cilia. Sporophyte terminal or lateral. Stems usually more or less prostrate, less frequently erect.

8. Family FUNARIACEÆ

Small terrestrial plants with broad, soft, very laxly areolate leaves in comal tufts. Costa slender, usually ending below apex. Leaf cells smooth, rhomboidal above, rectangular toward base. Seta elongate, erect; capsule erect or curved and asymmetrical, smooth or sulcate; peristome when present single, or double with segments of endostome opposite oblique teeth; lid planoconvex; calyptra smooth, cucullate, long-beaked, inflated below.

46. Genus FUNARIA Hedw.

Funaria HEDW., Sp. Musc. (1801) 172.

Autoicous; male flower terminal on a branch from near base of stem. Small plants with the characters of the family.

Key to the species of Funaria.

Capsule smooth, peristome simple .... 1. *F. luzonensis.*
Capsule sulcate, peristome double .... 2. *F. calvescens.*

1. FUNARIA LUZONENSIS Broth. Plate 9, fig. 147.

Funaria luzonensis BROTH., Philip. Journ. Sci. § C 3 (1908) 19.

Small, densely gregarious plants, dull yellowish green. Stems erect, 3 to 4 mm high, naked and radiculose below. Comal leaves erect-spreading, oblong-ovate, concave, abruptly acuminate, 1.5 to 2 mm long; margins erect, serrulate in upper half; costa rather strong, ending below apex in base of acumen; upper cells oval-hexagonal, 20 to 30 μ wide, gradually more elongate below, basal cells rectangular, bordered all around with one row of narrower, linear or rhomboidal, pellucid cells. Seta very slender, erect, yellow, up to 15 mm long; capsule smooth, suberect, ovoid with a long tapering neck, contracted below mouth when dry; peristome simple, teeth short, distant, striolate, inserted below rim; lid planoconvex; calyptra pale, much inflated below; spores papillose, 30 to 40 μ.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4929*; Mount Tonglon, *Merrill 4834* (type); Baguio, *Williams 1830*; Pauai, *Mearns 4552*.

Endemic.

Distinguished at a glance from *F. calvescens* by the smooth, subcrect capsules.

2. FUNARIA CALVESCENS Schwaegr. Plate 9, fig. 148.

Funaria calvescens SCHWAEGR., Suppl. 1 pt. 2 (1816) 77.

Gregarious in patches, often on burned, sterile ground. Stems up to 1 cm high, erect. Lower leaves small, comal leaves erect, concave, oblong-ovate, short-pointed; margins erect, entire; costa nearly percurrent; cells lax, hexagonal or rhomboidal, narrower toward margins. Seta slender, flexuose, up to 5 cm long; capsule pale or brownish, pyriform, asymmetrical, curved, rounded on back, deeply sulcate when dry, mouth oblique; peristome double, segments of endostome shorter than oblique teeth; annulus broad, spores 12 to 15 μ.

LUZON, frequent. MINDORO, Sablayan, *Merritt 11095.*

Distribution: Cosmopolitan.

The Philippine collections are referable to this species, which is, in all probability, only a luxuriant form of *F. hygrometrica* Hed., with longer setæ and more erect capsules.

9. Family SPLACHNACEÆ

Small or medium-sized plants with flaccid, broad, laxly areolate leaves, usually shrunken when dry, costa ending below apex or excurrent. Seta elongate; capsule erect, with a short or long neck; peristome when present simple, composed of 16 teeth, often united in pairs; lid conic or rostrate, calyptra naked or pilose.

Key to the genera of Splachnaceæ.

1. Robust plants, leaf apex acuminate.......... 49. *Tayloria.*
   Minute plants, leaf apex broadly rounded.......... 2.
2. Upper leaf cells papillose, peristome none.......... 47. *Gymnostomiella.*
   Leaf cells smooth, peristome present.......... 48. *Splachnobryum.*

47. Genus GYMNOSTOMIELLA Fleisch.

Gymnostomiella FLEISCH., Laubmfl. Java 1 (1900–1902) 309.

Dioicous; minute, delicate plants, densely gregarious. Stems filiform, sparsely radiculose below. Leaves scattered, more crowded in comal tufts, obovate, concave; margins erect; costa faint, ending below apex or near midleaf; areolation lax, upper cells hexagonal, papillose, lower cells rectangular, smooth. Seta up to 5 mm long; capsule erect, ovoid, peristome none; lid subulate-rostrate from a conic base.

Key to species of Gymnostomiella.

Costa faint, ending near midleaf.......... 1. *G. vernicosa.*
Costa strong, ending near apex.......... 2. *G. longinervis.*

1. GYMNOSTOMIELLA VERNICOSA (Hook.) Fleisch. Plate 9, fig. 149.

Gymnostomiella vernicosa (Hook.) FLEISCH., Laubmfl. Java 1 (1900–1902) 310.

Gymnostomum vernicosum HOOK., Wall. Cat. no. 7649; Ic. Pl. Rar. 137, *pl. 17, fig. 4*; Lond. Journ. Bot. 2 (1840) 2.

Exceedingly small, delicate plants in thin mats. Stems up to 5 mm long. Leaves distant except in comal tufts, minute, obovate, concave, up to 0.25 mm long; margins erect, entire below, papillose-crenulate above; costa short and faint, ending near midleaf; upper cells hexagonal, with firm, yellowish walls, 10 to 13 μ wide, sparsely but coarsely papillose, more elongate, rectangular, smooth and hyaline in lower half of leaf. Ovoid gemmæ occur frequently on the stems and rhizoids of the sterile plants.

LUZON, Laguna Province, Mount Maquiling, *Robinson 17139*: Manila, Santa Mesa, *Bartlett 16221*. PANAY, Iloilo Province, Tigtom River, *Robinson 18051*.

Distribution: India, Burma, Singapore, Java, Amboina.

The plants are too small to present any tangible characters to the naked eye, but will be easily recognized under the microscope by the rounded, laxly areolate leaves with papillose upper cells.

2. **GYMNOSTOMIELLA LONGINERVIS** Broth. Plate 9, fig. 150.

Gymnostomiella longinervis BROTH., Philip. Journ. Sci. § C 13 (1918) 205.

Gymnostomiella ryukyuensis TOYAMA, Spic. Musc. As. Or. 3 (1937) 101.

Slightly larger than *G. vernicosa*. Stems up to 8 mm long. Leaves up to 0.8 mm long, more oblong obovate; costa relatively strong, yellowish, ending just below apex; upper cells larger, 16 to 20 µ wide, more strongly papillose, basal cells rectangular, smooth, with yellowish pellucid walls. Fruit unknown.

PANAY, Iloilo Province, Tigtom River, *Robinson 18053*.

Distribution.—Liukiu Archipelago, inc. Okinawa.

Very distinct from *G. vernicosa* in the larger, more oblong leaves, longer, distinct, costa, and the less clearly differentiated lower leaf cells which instead of being hyaline are similar in appearance to the upper cells, although smooth and of a different shape.

43. Genus SPLACHNOBRYUM C. M.

Splachnobryum C. M., Verh. Z. B. Ges. Wien (1869) 503.

Dioicous; usually small plants in soft, lax tufts. Stems laxly foliate. Leaves oblong or spathulate, rounded, and usually crenulate at apex; costa slender, ending below apex; cells lax, smooth, thin-walled, subhexagonal above, larger and rectangular below. Seta slender, erect; capsule ovoid or cylindric, erect; peristome teeth 16, papillose, deeply inserted; lid short, conical; calyptra cucullate.

I have a suspicion that *Splachnobryum* and *Gymnostomiella* would be placed to better advantage in Pottiaceæ. The lax areolation is the only feature by which they are related to Splachnaceæ, while on the other hand the small size, the rounded leaf apices, and the sporophyte details are all more indicative of the other alliance.

Key to the species of Splachnobryum.

1. Leaf margins recurved.. 1. *S. indicum.*
   Leaf margins plane .... 2.
2. Stems less than 5 mm high, leaves oblong, under 1 mm.... 3. *S. luzonense.*
   Stems more than 10 mm high, leaves broadly ovate, to 2 mm long.
   2. *S. latifolium.*

1. SPLACHNOBRYUM INDICUM Hampe and C. M. Plate 9, fig. 151.

Splachnobryum indicum HAMPE & C. M., Linnaea 37 (1872) 176.

Delicate, soft, fragil plants in rather dense tufts, pale green, without lustre. Stems about 2 cm long, simple, laxly foliate, sparingly radiculose below. Leaves erect-spreading, very slightly contorted when dry, 2 to 2.5 mm long, 1 mm wide, concave, oblong-lingulate, broadly rounded at apex; margins narrowly recurved on one or both sides from near base about ⅔ up leaf, minutely crenulate across broad apex; cells lax, with thin, delicate walls, chlorophyllose, obliquely rhomboidal and parenchymatous near apex, marginal row subquadrate or short-rectangular, more elongate, oblong-hexagonal and prosenchymatous below; costa slender, ending some distance below apex. Sporophyte not seen.

CEBU, Camp 4, river bank, *F. Nemenzo 8.*

Distribution: India, Java.

I am not at all confident that this collection is correctly referred to *S. indicum.* The stems are appreciably longer and the leaves much larger than in the plants described by Fleischer, but the recurved margin is a sharp diagnostic character clearly separating this collection from either of the other local species. The relative difference in size seems inadequate as a character upon which to base a separate species.

Apart from the recurved margins *S. indicum*, as represented by this collection, differs from *S. latifolium* in the more oblong, narrower leaves less contorted when dry and in the laxer and longer areolation.

2. SPLACHNOBRYUM LATIFOLIUM Bartram sp. nov. Plate 10, fig. 152.

Dioicum; sat robustum, dense caespitosum, caespitibus mollibus, viridibus. Caulis erectus, ad 1.5 cm altus, irregulariter ramosus. Folia sicca contorta, humida patentia, concava, late ovata, apice rotundata, ad 2 mm longa et 1.5 mm lata; marginibus planis, superne crenulatis; costa sub apice evanida; cellulae laeves, ovali-hexagonae, tenerae, 16 ad 18 µ latae et 50 µ longae, marginales minores, basilares majores oblongo-hexagonae. Caetera ignota.

Dioicous; relatively robust plants in dense, soft tufts, dull green. Stems erect, to 1.5 cm long, irregularly branched. Leaves shrunken and contorted when dry, widely spreading when moist, concave, to 2 mm long and 1.5 mm wide, broadly ovate, rounded at apex; margins plane, crenulate in upper half; costa ending below apex; cells smooth, with thin delicate walls, oval-hexagonal, 16 to 18 μ wide and to 60 μ long, smaller at margins and larger, laxer, and oblong-hexagonal toward base. Sporophyte unknown.

LUZON, Rizal Province, Hinulugan Taktak (waterfall), near Antipolo, *Bartlett 15281a.*

Endemic.

The very broad, often nearly suborbicular leaves seem to separate adequately this plant from any of its allies in Malaysia. It is probably nearest to *S. Wiemansii* of Java, but the leaves show little or no evidence of the throatlike constriction at the apex which Fleischer attributes to this species.

4. SPLACHNOBRYUM LUZONENSE Broth. Plate 24, fig. 161.

Splachnobryum luzonense BROTH., Philip. Journ. Sci. 8 C 8 (1913) 70.

Small, dull-green plants in dense, soft tufts. Stems 2 to 3 mm long, erect, simple. Leaves lightly contorted when dry, spreading when moist, the upper ovate-oblong, slightly concave, to 0.8 mm long, apex rounded; smaller and more ovate below; margins plane or very slightly reflexed, crenulate toward apex; costa faint, ending below apex; areolation smooth, lax, and delicate, upper cells irregularly rhomboidal, 6 to 10 μ wide, 1 to 2 times as long, gradually larger below, basal cells oblong-hexagonal, 3 to 4 times as long as wide. Seta 4 mm long; capsule erect, oblong-cylindric, a scant 1 mm long; lid bluntly conical, 0.22 mm high; peristome teeth short, brownish, papillose, irregularly cleft above, projecting about 75 μ above rim; spores minutely papillose, 12 to 15 μ.

LUZON, Rizal Province, Malapad na Bato, *Robinson 14196* (type); Kay Ungulan, *Bartlett 15335*; Manila, Santa Mesa, *Bartlett 16211.*

Endemic.

The type collection is represented in the Bureau of Science herbarium by a small tuft composed largely of male plants. The sporophyte characters given above are taken from Bartlett's *16211* which is in good fruit.

49. Genus TAYLORIA Hook.

Tayloria Hook., Journ. Sci. Arts 3 (1816) 144.

Robust, densely tufted plants. Stems erect. Leaves broad, laxly areolate; cells hexagonal, smooth; costa excurrent. Seta fleshy, elongate; capsule erect, gradually narrowed to a short neck; peristome teeth in 8 pairs; calyptra conical, papillose or pilose.

Key to the species of Tayloria.

Calyptra long pilose .... 1. *T. indica.*
Calyptra papillose .... 2. *T. subglabra.*

1. **TAYLORIA INDICA** Mitt. Plate 10, fig. 154.

Tayloria indica Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 57.

Octoblepharum serratum Hook., Musc. Exot. (1820) *pl. 116.*

Dioicous; robust plants in dense tufts, dull yellowish green above, brown below. Stems 1.5 to 2 cm high, densely reddish tomentose and matted together with radicles below. Lower leaves small, distant, upper leaves crowded, larger, 2.5 to 3 mm long, oblong-ovate, aristate, carinate-concave; margins erect, entire below, coarsely toothed toward apex; costa yellow, excurrent in a long arista; upper cells oval-hexagonal, about 25 µ wide, gradually longer and rectangular toward base. Seta stout, yellow, 7 to 8 mm long; capsule erect, cylindric, urn 2 mm long, with a short, narrow apophysis less than 1 mm long; peristome teeth 16, in 8 pairs, erect when dry; lid conic, short; calyptra conical, pilose with long, pale, jointed hairs especially toward laciniate base.

LUZON, Benguet Subprovince, Baguio, *Williams 3145.*

Distribution: Himalayas.

A highly individual species which will be known at once by the coarsely toothed, laxly areolate leaves ending in a long, bristlelike point.

2. **TAYLORIA SUBGLABRA** (Griff.) Mitt. Plate 10, fig. 155.

Tayloria subglabra (Griff.) Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 57.

Orthodon subglaber Griff., Not. 399; Icon. Pl. Asiat. 2 (1849) *pl. 74, fig. 2.*

Robust plants resembling *T. indica.* Upper leaves less crowded and more widely spreading both moist and dry. Seta more deeply colored, reddish; calyptra deeply laciniate at base, naked and smooth below, scabrous in upper half with short, blunt, unicellular, hyaline teeth.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1681*.

Distribution: Himalayas.

Apart from the marked differences in the calyptræ the distinctions between this species and *T. indica* seem to be trivial and of minor importance.

10. Family BRYACEÆ

Plants of variable size, usually tufted. Stems erect, radiculose below, often with subfloral innovations. Lower leaves small, upper larger, lanceolate; costa ending in or near apex; cells linear or rhomboidal, thin-walled, smooth, often narrower in several rows at margins. Seta elongate; capsule inclined or pendulous, rarely erect, clavate or pyriform with a distinct, tapering neck; peristome normally double, outer composed of 16 lanceolate teeth, inner rudimentary or composed of 16 keeled segments alternating with teeth from a high basal membrane, usually with intermediate cilia; lid short, conical.

Key to the genera of Bryaceæ.

1. Capsules erect	2.
Capsules inclined or pendulous	3.
2. Leaf cells linear, peristome teeth in pairs	51. *Pseudopohlia*.
Leaf cells rhomboidal, peristome teeth not paired	52. *Brachymenium*.
3. Stems julaceous, leaves erect, imbricated	53. *Anomobryum*.
Stems not julaceous, leaves spreading	4.
4. Leaf cells linear, cilia nodose	50. *Webera*.
Leaf cells rhomboidal, cilia mostly appendiculate	5.
5. Robust plants, setæ often clustered	55. *Rhodobryum*.
Small plants, seta solitary	54. *Bryum*.

50. Genus WEBERA Hedw.

Webera HEDW., Sp. Musc. (1801) 168.

Slender, tufted plants with erect stems. Leaves lanceolate, indistinctly bordered, usually denticulate toward apex; costa ending in or below apex; cells linear or narrowly rhomboidal, shorter and rectangular toward base; capsule inclined or pendulous, pyriform, with a distinct neck; peristome double, cilia generally nodose; lid short, conic or convex.

Key to the species of Webera.

1. Capsule slender, with a long neck	2.
Capsule shorter, clavate, with a short neck	3.
2. Capsule 3 to 6 mm long, neck usually longer than urn	1. *W. elongata*.
Capsule 2.5 to 3 mm long, neck usually shorter than urn.	2. *W. Hampeana*.

3. Seta 3 to 4 cm long, capsule ovoid, suberect.... ... 3. *W. scabridens.*
   Seta 2 to 2.5 cm long, capsules clavate, pendulous........................ 4.
4. Inflorescence paroicous .... 4. *W. nutans.*
   Inflorescence dioicous .... 5. *W. saxensis.*

1. WEBERA ELONGATA (Hedw.) Schwaegr. Plate 10, fig. 156.

Webera elongata (Hedw.) SCHWAEGR. in L. Sp. Pl. ed. 4 pt. 2 5 (1830) 48.

Pohlia elongata HEDW., Sp. Musc. (1801) 171.

Paroicous, antheridia in axils of comal leaves. Loosely tufted plants. Stems short, usually less than 1 cm long. Lower leaves small, scattered, comal leaves crowded, erect-spreading, lanceolate, acuminate, 3 to 3.5 mm long; margins recurved, denticulate toward apex; costa percurrent or short-excurrent; upper cells linear-rhomboidal with firm walls, narrowly rectangular below. Seta slender, up to 3 cm long, reddish below; capsule inclined, cylindric or slenderly clavate, slightly curved, urn 2.5 mm long, tapering to a neck of about same length or longer; peristome teeth yellowish, papillose, inner peristome pale, papillose, cilia nodose, shorter than segments; lid conic, apiculate; spores papillose, about 15 µ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1765;* Mount Data, *Merrill 4916, Hadden 1200;* "Haights in the Oaks," *Mearns 4554;* Pauai, *McGregor 8985, 8700.*

Distribution: Wide in Europe, North America, Himalayas, Yunnan, Japan.

On ground in the higher mountains, infrequent. The slender, gracefully poised capsules are usually produced in abundance and mark the species to good advantage.

2. WEBERA HAMPEANA Lac. Plate 10, fig. 157.

Webera Hampeana LAC., Bryol. Jav. 1 (1860) 137, *pl. 113.*

Paroicous; closely resembling *W. elongata*, but the setæ usually shorter, 1.5 to 2 cm long, and the capsules less slender, broadly clavate; urn scarcely 2 mm long, gradually contracted to a shorter neck about 1.5 mm long.

NEGROS, Canlaon Volcano, *Merrill 6808.*

Distribution: Java, Celebes, Ceylon.

Open slopes on ground. The capsules of this species are shorter, thicker and decidedly less slender than those of *W. elongata*. Otherwise the plants are quite similar and would be indistinguishable without fruit.

3. WEBERA SCABRIDENS (Mitt.) Jaeg. Plate 10, fig. 158.

Webera scabridens (Mitt.) JAEG., Adumbr. 1 (1873-1874) 592.
Bryum scabridens MITT., Journ. Linn. Soc. Bot. 8 (1864) 151.

Dioicous; small plants in loose tufts. Stems erect, slender, up to 2 cm long, often with several subfloral innovations, sparsely radiculose below. Leaves uniformly well spaced, erect-spreading, slightly curved or shrunken when dry, lanceolate, broadly acuminate, 2 to 2.5 mm long; margins plane or slightly reflexed, denticulate toward apex; costa reddish, ending in or just below apex; cells very long and narrow, slightly vermicular, 4 to 5 μ wide, 10 to 14 times as long, wider and narrow rectangular below. Seta very slender, reddish, up to 5 cm long or longer; capsule pyriform, suberect, urn about 2 mm long, tapering to a short, thick neck about 1 mm long, exothecial cells hexagonal, thin-walled, 50 μ in diameter; peristome teeth pale, densely papillose, inner peristome finely papillose, segments narrow from a high basal membrane, cilia rudimentary; lid short, conic-rostrate; spores papillose, 12 to 16 μ. Slender, vermicular gemmæ frequent in upper leaf axils of sterile stems.

LUZON, Benguet Subprovince, Baguio, *Robinson 14095*, *Williams 1762*; Mount Tonglon, *Ramos 5507*: Bontoc Subprovince, Mount Cana, *Ramos & Edaño 38229*.

Distribution: Japan.

Open banks in the mountains. Characterized by the short, thick-necked suberect capsules on very long, slender setæ. The gemmiferous sterile stems are also noteworthy.

4. WEBERA NUTANS Hedw. Plate 10, fig. 159.

Webera nutans HEDW., Sp. Musc. (1801) 168.
Webera duriuscula BROTH., Philip. Journ. Sci. § C 8 (1913) 71.
? *Pseudopohlia Merrillii* BROTH., Philip. Journ. Sci. § C 13 (1918) 207.

Paroicous; small, loosely tufted, yellowish green plants. Stems erect, less than 1 cm high. Lower leaves small and scattered, upper leaves crowded in a comal tuft, lanceolate, acuminate, up to 3 mm long; margins slightly recurved below, denticulate toward apex; costa ending in or just below apex; cells linear or narrowly rhomboidal, 7 to 10 μ wide and 5 to 7 times as long, laxer and more rectangular toward base. Seta up to 2.5 cm long; capsule pendulous, oblong-pyriform, about 2.5 mm long including short neck; annulus broad; lid convex, apiculate; peristome teeth finely papillose, segments of inner peristome widely split, from a high basal membrane, cilia nodulose; spores 15 to 18 µ.

NEGROS, Canlaon Volcano, *Merrill 6832*, *6814* in part, *6817* in part.

Distribution: Nearly cosmopolitan; Europe, Asia, North America, South America, Japan.

Open slopes at high elevations. Well-developed fruiting plants in *No. 6832* show no appreciable differences from accepted forms of *W. nutans*, and I fail to see how *W. duriuscula* can be maintained. It is curious that this plant should appear in Negros while, so far, it is unknown from the mountains of Luzon.

No. 6817 is mostly *Rhamphidium Dixoni* with a slight mixture of *W. nutans*. I have examined a number of the *Webera* plants and find them all clearly paroicous. Some capsules are in fair condition and show the typical *Webera* peristome. Unless there was a further mixture and Brotherus had under observation something different I can find no reason for continuing *Pseudopohlia Merrillii*. Some of the stems show a few axillary gemmæ—an unusual feature in *W. nutans*—but otherwise the plants seem to have no distinctive characters.

6. WEBERA SAXENSIS (Williams) Broth. Plate 10, fig. 160.

Webera saxensis (Williams) BROTH., E. & P. Pflanzenfam. ed. 2 10 (1924) 360.

Pohlia saxensis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 347.

Dioicous; small yellowish, slightly glossy plants in lax tufts, matted with radicles below. Stems erect, up to 1.5 cm long, usually with several subfloral innovations, laxly foliate. Leaves erect-spreading, ovate-lanceolate, sharply acuminate, up to 3 mm long; margins narrowly recurved below, denticulate toward apex; costa short-excurrent; cells very long and narrow, 6 to 8 µ wide and 10 to 15 times as long, laxer and more rectangular below, reddish at base. Seta up to 2.5 cm long, reddish; capsule inclined or horizontal, oblong-pyriform, urn 1.5 mm long with a tapering neck of about same length, exothecial cells with thin walls; peristome teeth reddish at base, finely papillose, distinctly bordered, segments of inner peristome widely split, from a high basal membrane, cilia strongly appendiculate; annulus broad; lid convex, blunt; spores 10 to 12 µ.

MINDANAO, Sax River, *Williams 2393*.

Endemic.

On log. A unique species combining the typical leaf structure of *Webera* and the peristome characters of *Eubryum*.

51. Genus PSEUDOPOHLIA Williams

Pseudopohlia WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 346.

Medium-sized plants with the leaf structure and general appearance of *Webera*. Seta very long and slender; capsule erect, ovoid-cylindric, tapering to a short neck; peristome teeth united in 8 pairs on outer surface about three-fourths of way up, widely divided in median part on inner face, segments of inner peristome narrow, as long as teeth, cilia present.

PSEUDOPOHLIA BULBIFERA Williams. Plate 10, fig. 143.

Pseudopohlia bulbifera WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 346.

Dioicous; dull yellowish-green plants in dense tufts. Stems erect, up to 1.5 cm long with a few short, subfloral innovations, radiculose below. Leaves crowded, rigidly erect-spreading, 2 to 2.5 mm long, ovate-lanceolate, acute; margins plane or slightly recurved, denticulate above; costa ending just below apex; cells linear, incrassate, 6 to 8 μ wide and 8 to 12 times as long, laxer and more rectangular toward base. Seta reddish, 4 to 7 cm long; capsules erect, 3 to 4 mm long, ovoid-cylindric, tapering to a short neck; peristome teeth short, about 0.3 mm long, united in 8 pairs on outer surface, papillose, inner peristome pale, faintly papillose, segments narrow, widely split, as long as teeth, cilia nodulose, free or united at tips; spores papillose, 20 to 23 μ. Obovate, short-stalked gemmæ with short, leaflike points are frequent in upper leaf axils.

LUZON, Benguet Subprovince, between Baguio and Sablan, *Williams 1770* (type): Nueva Vizcaya Province, *McGregor 30231*.

Endemic.

On rocks, rare. Distinguished from *Webera* by the erect capsules and the paired teeth of the outer peristome.

52. Genus BRACHYMENIUM Schwaegr.

Brachymenium SCHWAEGR., Suppl. 2 pt. 1 (1823) 131.

Small to medium-sized, tufted plants. Stems erect with numerous subfloral branches. Leaves erect or spreading, ovate, acuminate; costa excurrent; cells rhomboidal or linear, smooth. Seta elongate; capsule suberect; peristome double, teeth 16, papillose, basal membrane of inner peristome high, segments short and rudimentary, cilia none.

Key to the species of Brachymenium.

1. Robust plants, leaves bordered.. 4. *B. nepalense.*
   Small plants, leaves not bordered.. 2.
2. Median leaf cells linear, 100 µ long or longer.............. 1. *B. acuminatum.*
   Median leaf cells rhomboidal less than 50 µ long.. 3.
3. Capsule short-ovoid, lid sharply pointed.............................. 2. *B. exile.*
   Capsule ovoid-cylindric, lid blunt or rounded.............. 3. *B. coarctatum.*

1. BRACHYMENIUM ACUMINATUM Harv. Plate 10, fig. 162.

Brachymenium acuminatum HARV. in Hook. Ic. Pl. rar. (1841) *pl. 19, fig. 3*; Lond. Journ. Bot. 2 (1840) 10.

Dioicous; slender, pale yellowish-green plants in dense mats. Stems erect, red, radiculose below, up to 5 mm long, with one to several julaceous innovations 5 to 8 mm long. Leaves crowded, erect with spreading points, barely 1 mm long, ovate-lanceolate, acuminate, deeply concave, cuspidate by excurrent costa; cells linear, 10 µ by 100 to 125 µ, with thin, delicate walls, laxer, shorter, and subrectangular at base. Seta 2 to 2.5 cm long, often curved at tip; capsule ovoid-cylindric, erect or inclined, 2.5 to 3 mm long; lid conic, short and blunt; peristome teeth narrow, widely spaced, basal membrane of inner peristome about half height of teeth, segments very rudimentary; spores 12 to 15 µ.

LUZON, Benguet Subprovince, Baguio, *Williams 1767.*

Distribution: Eastern India.

On earth walls. Quite distinct from *B. exile* and *B. coarctatum* in the julaceous innovations and the long, narrow leaf cells.

2. BRACHYMENIUM EXILE (Doz. and Molk.) Bryol. Jav. Plate 10, fig. 161.

Brachymenium exile (Doz. & Molk.), Bryol. Jav. 1 (1860) 139.

Bryum exile Doz. & Molk., Ann. Sci. Nat. (1840) 300.

Dioicous; small plants in dense tufts or mats. Stems very short, with slender innovations up to 6 mm long. Leaves erect, closely imbricated, 0.6 to 1 mm long, ovate, concave; margins erect or slightly recurved below, entire; costa strong, excurrent in a short, stiff cuspidate point; cells hexagonal-rhomboidal, thin-walled, up to 10 µ by 35 µ, narrower toward margins, laxer and more rectangular at base. Seta 1 to 1.5 cm long, red; capsule erect or nearly so, up to 2 mm long; peristome teeth finely papillose, basal membrane of inner peristome half as high as teeth, segments very rudimentary; lid conic, apiculate; spores 8 to 10 µ. Ovoid, axillary gemmæ are often found in some abundance on the sterile stems.

LUZON, Benguet Subprovince, *Ramos 5860*; Baguio, *Williams 1768*; Bontoc Subprovince, Bauco, *Vanoverbergh 66*.

Distribution: Ceylon, Java, Sumatra, Hawaii.

On shaded banks, infrequent.

4. BRACHYMENIUM COARCTATUM (C. M.) Bryol. Jav. Plate 19, fig. 164.

Brachymenium coarctatum (C. M.), Bryol. Jav. 1 (1860) 140, *pl. 115*.
Bryum coarctatum C. M., Syn. 1 (1849) 312.

Dioicous; small plants closely resembling *B. exile* in habit and structural details. Costa excurrent in a rather longer, minutely denticulate point. Capsules narrowly ovoid-cylindric, erect; lid shorter, more bluntly conical.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 1308*.

Distribution: Java, New Caledonia.

On banks. Apart from the shape of the capsules there is little to separate this species from *B. exile*. Some of the plants in the above collection are typical, while others verge toward *B. exile* in the ovoid capsules. Further collections are needed to definitely establish *B. coarctatum* in the local flora.

5. BRACHYMENIUM NEPALENSE Hook. Plate 19, fig. 165.

Brachymenium nepalense Hook. in Schwaegr., Suppl. 2 pt. 2 (1823) 131, *pl. 135*.
Bryum orthopelma C. M., Linnaea 38 (1874) 650.

Autoicous; robust, pale-green plants in dense tufts, slightly glossy. Stems erect, branched, up to 1.5 cm high, matted together with reddish tomentum below. Upper leaves crowded in comal tufts, more scattered below, spirally twisted when dry, oblong-lingulate or narrowly spathulate, about 4 mm long and 1 mm wide, acuminate, distinctly bordered; margins narrowly recurved, toothed toward apex; costa strong, brownish, excurrent in a long, denticulate arista; cells short, rhomboidal, 15 to 20 μ wide and twice as long, with thin walls, linear and incrassate toward margins, forming a yellowish border up to 8 rows wide, rectangular and laxer toward base. Seta red, 2 to 6 cm long or longer; capsule suberect, narrowly pyriform, reddish brown, about 4 mm long; annulus broad; lid bluntly conical; peristome teeth closely spaced, papillose, inner peristome about three-fourths height of teeth, segments short and rudimentary; spores papillose, 25 to 35 μ.

LUZON, Benguet Subprovince, Mount Data, frequent by various collectors; Bontoc Subprovince, Mount Bana; Laguna Province, Mount Banahao. MINDANAO, Davao Province, Mount Apo, *Copeland 1009*. CAMIGUIN DE MINDANAO, *Ramos 14599*.

Distribution: Eastern India, Siam, Java, Sumatra, Borneo, Celebes.

On tree trunks and more rarely on the ground. Frequent in mountain regions and very variable in the length of the setæ. *Bryum orthopelma* is typical of the species in every particular. Fruit is usually produced in abundance.

53. Genus ANOMOBRYUM Schimp.

Anomobryum SCHIMP., Syn. ed 1 (1860) 382.

Dioicous; slender, pale-green plants, often glossy. Stems branched, uniformly foliate, julaceous. Leaves deeply concave, blunt or rounded at apex; costa often short, ending well below apex; upper cells linear, more or less incrassate, basal cells lax, rectangular or subquadrate. Sporophyte much as in *Eubryum*, peristome normally perfectly developed, with appendiculate cilia, but occasionally more or less rudimentary.

Key to the species of Anomobryum.

Leaves acute, costa percurrent.. 2. *A. gemmigerum*.
Leaves very bluntly obtuse, costa ending I up................ 1. *A. cymbifolium*.

1. ANOMOBRYUM CYMBIFOLIUM (Lindb.) Broth. Plate 10, fig. 166.

Anomobryum cymbifolium (Lindb.) BROTH., Rec. of the Bot. Survey of India 1 (1899) 320.

Bryum cymbifolium LINDB., Man. Musc. 1 (1870) 45.

Slender, slightly glossy plants. Stems erect, about 1 cm long, with 1 to 3 subfloral, julaceous innovations 8 to 10 mm long. Leaves erect, closely imbricated, 1 mm long, deeply concave, obtusely rounded, margins erect, minutely crenulate near apex; costa pale, ending well below apex; upper cells linear, vermicular, incrassate, basal cells lax, rectangular and rhomboidal. Seta red, 2 to 2.5 cm long; capsule horizontal or pendulous, ovoid; peristome teeth pale, well spaced, endostome not seen (capsules immature); annulus broad; lid conic, short.

LUZON, Benguet Subprovince, Bued Canyon, *Bartlett 13886* in part; *Merrill 7836* in part, *7878* in part; Trinidad, *Williams 2146* in part; "Haight's in the Oaks," *Mearns 4542*, in fruit.

Distribution: Himalayas, Khasia, southern India, Java, Amboina.

On banks and rocks in the mountains. Infrequent and usually mixed with other mosses. This is one of the few species of *Anomobryum* with a more or less rudimentary inner peristome.

2. ANOMOBRYUM GEMMIGERUM Broth. Plate 10, fig. 167.

Anomobryum gemmigerum Broth., Philip. Journ. Sci. § C 5 (1910) 146.

Slender, pale-green, slightly glossy plants in lax tufts. Stems simple or sparingly branched, up to 3 cm long, flexuose, often with abundant, obovate, foliose gemmæ in upper leaf axils. Leaves rigidly erect, closely imbricated, 1 to 1.2 mm long, oblong-ovate, acute, concave; margins erect, minutely crenulate near apex; costa slender, percurrent or nearly so; upper cells linear or narrowly rhomboidal, vermicular, slightly incrassate, up to 10 μ wide and 10 to 12 times as long, shorter and laxer toward base. Sporophyte unknown.

LUZON, Benguet Subprovince, Bugias, *Bacani 15936* (type): Bontoc Subprovince, *Vanoverbergh 727*.

Endemic.

On trees and damp soil. The acute leaves and axillary gemmæ will distinguish this species from *A. cymbifolium*.

54. Genus BRYUM Hedw.

Bryum Hedw., Sp. Musc. (1801) 178, *emend*; Schimp., Syn. ed. 1 (1860).

Small or medium-sized plants. Stems erect, usually with subfloral innovations. Lower leaves small and scattered, upper larger, often in comal tufts; cells smooth, rhomboidal, usually narrower in several rows at margins; costa percurrent or excurrent, rarely shorter. Seta elongate, curved or hooked at tip; capsule generally pendulous, pyriform or clavate with a tapering neck; peristome double, outer of 16 entire teeth, inner pale with a high basal membrane bearing 16 keeled segments alternating with teeth and 1 to 3 intermediate cilia; lid convex, apiculate.

Key to the species of Bryum.

1. Plants silvery, upper leaf cells hyaline........ 2.
   Plants green or reddish, leaf cells chlorophyllose........ 3.
2. Cilia appendiculate........ 3. *B. argenteum.*
   Cilia nodulose........ 4. *B. microthecia.*
3. Cilia none or rudimentary........ 4.
   Cilia well developed, appendiculate........ 5.
4. Costa stout, excurrent in a cuspidate point........ 2. *B. abditum.*
   Costa slender, usually ending in a minute mucro........ 1. *B. cellulare.*
5. Leaves unbordered or with one marginal row of elongated cells........ 6.
   Leaves clearly bordered with several rows of elongated cells........ 7.

6. Capsule neck thick, broad and spongy, abruptly contracted to seta.
5. *B. coronatum.*
Capsule neck slender, tapering to seta.................................... 7. *B. ambiguum.*
7. Robust plants, leaves coarsely toothed above..... .... 9. *B. ramosum.*
Medium-sized plants, leaves minutely toothed above.................................... 8.
8. Leaves spirally contorted when dry, capsule brown.......... 8. *B. capillare.*
Leaves not contorted when dry, capsule deep red.... 6. *B. chrysobasilare.*

1. **BRYUM CELLULARE** Hook. Plate 10, fig. 168.

Bryum cellulare Hook. in Schwaegr. Suppl. 3 pt. 1 (1827) pl. 214.
Bryum compressidens C. M., Syn. 1 (1849) 290.
Bryum diversifolium Broth., Philip. Journ. Sci. § C 5 (1910) 147.
Brachymenium Cumingi Ther., Bull. Soc. Bot. Genève 26 (1936) 85.

Dioicous; densely tufted, soft plants, pale green tinged with red, slightly glossy. Stems fragile, erect, branched, equally foliate. Leaves erect-spreading, 1 to 1.5 mm long, ovate or oblong-ovate, concave, acute; margins erect, entire or nearly so; costa slender, reddish, percurrent or ending below apex; cells lax with thin, delicate walls, 15 to 20 µ wide and 6 to 8 times as long, marginal row linear, very long and narrow. Seta up to 2 cm long, red; capsule inclined, about 3 mm long, pyriform, glossy; peristome teeth striolate, segments of inner peristome narrow, from a rather low basal membrane, cilia none; spores papillose, 20 to 25 µ.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 93, 1770;* Batangas Province, Santo Tomas, *Ramos 13743;* Taal Volcano, *Merrill 10609;* Cavite Province, Silang and Balete, *Bartlett 14779, 14780.* CEBU, Camp 4, *Nemenzo 9, 10.*

Distribution: Himalayas, Sumatra, Java, eastern China, Japan.

On damp banks and rocks. Well marked by the pale tufts tinged with red and the very laxly areolate leaves. *B. diversifolium* Broth. is typical of this species in all essential particulars as far as I can see. My friend M. Theriot agrees with me that *Brachymenium Cumingi* Ther. should be included in the concept of *B. cellulare.*

2. **BRYUM ABDITUM** Williams. Plate 10, fig. 169.

Bryum abditum Williams, Bull. N. Y. Bot. Garden 8 (1914) 348.

Dioicous; closely resembling *B. cellulare.* Leaves about 1 mm long, oblong-ovate, concave, entire, apiculate; costa brown, excurrent in a stout apiculus; cells lax, rhomboidal, thin-walled, not appreciably narrower at margins. Seta up to 2 cm long; peristome teeth punctulate, not striolate, segments of inner peristome narrow from a rather low basal membrane, cilia none or rudimentary; spores papillose, 16 to 18 µ.

LUZON, Benguet Subprovince, Baguio, *Williams 3170.*

Endemic.

On rock walls. Apparently quite distinct from *B. cellulare* in the strongly apiculate, unbordered leaves and the punctulate peristome teeth.

3. **BRYUM ARGENTEUM** Hedw. Plate 21, fig. 170.

Bryum argenteum HEDW., Sp. Musc. (1801) 181.

Dioicous; small, silvery white, glossy plants with short stems and erect, julaceous branches. Leaves crowded, broadly ovate, concave, short-acuminate, up to 1 mm long; costa normally ending well below apex but excurrent in some forms; upper cells narrowly rhomboidal, colorless, with firm, pale walls, 10 to 12 μ wide, shorter and chlorophyllose toward base and often tinged with red. Seta red, up to 2 cm long, curved or hooked at tip; capsule red, horizontal or pendulous, oblong, abruptly contracted to a short neck; lid convex, apiculate; peristome double, cilia of endostome appendiculate.

LUZON, Benguet Subprovince, *Williams 1771;* "Haight's in the Oaks," *Mearns 4433:* Lepanto Subprovince, Balili, *Merrill 4950:* Bontoc Subprovince, Bauco, *Vanoverbergh 65.*

Distribution: Cosmopolitan.

On banks, rock walls, and in similar places. Most of these collections tend toward var. *lanatum* Bry. Eur. with longer acuminate leaves and the costa extending into the acumen or percurrent.

4. **BRYUM MICROTHECA** C. M. Plate 21, fig. 171.

Bryum microtheca C. M., Syn. 1 (1849) 314.

Bryum erectum BROTH., Philip. Journ. Sci. § C 3 (1908) 19.

Dioicous; slender, densely tufted, silvery white plants. Stems short, branches erect, julaceous. Leaves ovate, concave, short-acuminate, 1 mm long; margins erect, entire; costa slender, ending about ⅔ up the leaf; upper cells as in *B. argenteum*, lower cells rectangular, chlorophyllose. Seta up to 18 mm long, slender, red, flexuose, often more or less curved at tip; capsules erect or variously inclined, similar in size and form to *B. argenteum;* cilia of inner peristome nodulose, without appendages.

LUZON, Benguet Subprovince, Kabayan, *Merrill 4068, Bacani 15988;* Baguio, *Merrill 7660:* Bontoc Subprovince, *Ramos 7012.*

Endemic.

On dry slopes and boulders, infrequent. All of these gatherings, including the type collection of *B. erectum* Broth., show plants with setæ curved at the tips so that the capsules are nodding or even horizontal. The capsules are constricted below the mouth in varying degrees, but this is hardly a factor of prime importance. The characters distinguishing *B. erectum* are by no means convincing, and I imagine these forms can be safely merged with *B. microthecum*, which differs from the ubiquitous *B. argenteum* principally in the suberect capsules and the imperfectly developed cilia without appendages.

5. BRYUM CORONATUM Schwaegr. Plate 11, fig. 172.

Bryum coronatum SCHWAEGR., Suppl. 1 pt. 2 (1816) 103, *pl.* 71.
Bryum rufinerve C. M., Linnæa 38 (1874) 549.

Dioicous; slender, dull yellowish-green plants in dense tufts. Stems erect, about 1 cm high, laxly matted together with radicles, subfloral innovations numerous. Leaves laxly erect, lightly contorted when dry, ovate-lanceolate, concave, unbordered, entire, up to 3.5 mm long; costa excurrent in a rather long, minutely denticulate arista; cells narrowly rhomboidal, 10 to 12 µ wide and 4 to 6 times as long, thin-walled, shorter toward base. Seta up to 3 cm long, red; capsule pendulous, oblong from a conspicuous, spongy base wider than urn, abruptly contracted to seta; peristome teeth papillose, segments of inner peristome widely split, cilia 2 or 3, strongly appendiculate.

LUZON, numerous collections from widely separated localities. MINDORO, Puerto Galera, *Bartlett 13748, 13872.* PALAWAN, Tatay, *Merrill 8903;* Puerto Princesa, *Bermejos 243.* MINDANAO, Zamboanga Province, Ranga, *Whitford & Hutchinson 9109.*

Distribution: Cosmopolitan in tropical and subtropical regions.

On damp calcareous soil. Frequent and often at low altitudes. The peculiar capsule, when well developed, reminiscent of an acorn in the cup, is a marked feature. *B. rufinerve* C. M. is evidently only a minor form of this species. The capsules are immature, but the other characters are in agreement.

6. BRYUM CHRYSOBASILARE Broth. Plate 11, fig. 173.

Bryum chrysobasilare BROTH., Philip. Journ. Sci. § C 3 (1908) 19.

Dioicous; densely tufted plants, green tinged with brown, slightly glossy. Stems erect, up to 8 mm high, with several erect innovations. Lower leaves scattered, upper crowded, laxly erect-spreading, 2 mm long, ovate-lanceolate, acuminate, concave; margins narrowly recurved more than ⅔ up, minutely serrulate toward apex; costa excurrent; cells rhomboidal with firm, yellowish walls, 8 to 10 μ wide and 4 to 6 times as long, narrower at margins, forming a yellowish border 2 or 3 rows wide, short, quadrate-hexagonal and golden brown at extreme base. Seta 2 to 3 cm long, red, hooked at tip; capsule horizontal or pendulous, 4 to 5 mm long, deep reddish brown, oblong-cylindric with a short, tapering neck; lid glossy, short, conic, apiculate; peristome large, cilia of endostome appendiculate.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4956*.

Endemic.

On trees. An attractive species well characterized by the colored basal cells just above the insertion and the deep-red fruit.

7. BRYUM AMBIGUUM Duby. Plate 21, fig. 171.

Bryum ambiguum DUBY in Moritzi, Verz. (1845–1846) 132.

Dioicous; small, slender, tufted plants, dull yellowish green, stems up to 1 cm long, with subfloral innovations. Leaves rather scattered, laxly erect-spreading, about 1.5 mm long, ovate-lanceolate, short-acuminate, concave, unbordered; margins erect, entire or minutely denticulate above; costa usually short-excurrent; cells narrowly rhomboidal, 8 to 10 μ wide and 6 to 9 times as long, wider and laxer below. Seta 2 to 2.5 cm long, red, hooked at tip; capsule pendulous, narrowly pyriform, wide-mouthed with a slender, tapering neck; lid large, bluntly conical; peristome as in *B. coronatum*.

LUZON, Rizal Province, Mount Susong-Dalaga, *Ramos & Edaño 20451*; Mount Lumutan, *Ramos & Edaño 29819*; Montalban, *Bartlett 14626*: Bataan Province, Lamao, *Curran 7519*: Benguet Subprovince, Baguio, *Ramos 5865*, *Williams 1782*; Sablan, *Williams 3145*: Tayabas Province, Umiray, *Ramos & Edaño 29087*. PANAY, Iloilo Province, *Robinson 18203*. MINDORO, *Merritt 12140*. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens 842*, "*K*," "*R*."

Distribution: Sumatra, Java, Tonkin.

On earth. *Nos. 1782* and *3145* have been recorded and distributed as *B. australe* Hpe. which is described and figured as having very different shaped capsules. As they seem to agree with the other local collections of *B. ambiguum* I have included them here.

8. BRYUM CAPILLARE Hedw. Plate 21, fig. 176.

Bryum capillare HEDW., Sp. Musc. (1801) 182.

Dioicous; pale-green plants in lax, soft tufts. Stems up to 1 cm long, tomentose. Leaves shrunken and spirally twisted when dry, erect-spreading when moist, oblong-spathulate or obovate, acuminate, aristate, up to 3 mm long, narrowly bordered; margins recurved below, minutely serrulate toward apex; costa tapering upward from a stout base, excurrent in upper leaves in a sharp, brownish arista; cells oblong-hexagonal, thin-walled, chlorophyllose, 10 to 12 μ wide and 3 to 4 times as long, elongate toward margins forming a border 2 or 3 rows wide. Seta 2 to 3.5 cm long, red. Capsule horizontal, about 3 mm long, oblong-cylindric with a tapering neck; peristome perfect, endostome with a high basal membrane, cilia appendiculate.

LUZON, Benguet Subprovince, Baguio, *Williams 1785*.

Distribution: Europe, northern Africa, Asia, Japan, North America.

On rocks and earth.

BRYUM CAPILLARE Hedw. var. **RUBROLIMBATUM** (Broth.) Bartram comb. nov.

Bryum rubrolimbatum BROTH., Philip. Journ. Sci. § C 5 (1910) 148.

Leaf border red.

LUZON, Benguet Subprovince, Pauai, *McGregor 8702*.

This collection differs from the typical form only in the red leaf border. As this is a character of slight importance the form may be better treated as a variety. In a wider series of specimens it may not even be worthy of this rank.

3. **BRYUM RAMOSUM** (Hook.) Mitt. Plate 11, fig. 136.

Bryum ramosum (Hook.) MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or) (1859) 75.

Mnium ramosum HOOKER, Lond. Journ. Bot. 2 (1840) 11.

Dioicous; robust plants in lax, deep tufts, yellowish green above, brown below. Stems erect, usually branched, up to 6 cm long, densely tomentose, evenly foliate. Leaves laxly erect, twisted and contorted when dry, widely spreading when moist, oblong-spathulate, up to 5 mm long, short-acuminate, carinate-concave, broadly bordered; margins recurved below, sharply serrate toward apex; costa stout, brown, excurrent; cells hexagonal, thin-walled, 12 to 15 μ wide and 2 to 3 times as long, rectangular toward base. Seta 4 mm long or longer, hooked at tip; capsule reddish brown, oblong-cylindric, about 5 mm long; peristome perfect, segments of endostome from a high basal membrane, cilia strongly appendiculate. Reddish, filiform septate propagula are often abundant in the upper leaf axils.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1764*; Pauai, *Copeland 1824*; Mount Pulog, *Curran, Merritt, & Zschokke 16898*; Bontoc Subprovince, Mount Cana, *Ramos & Edaño 38231*; Mount Masapiled, *Ramos & Edaño 38246* in part: Lepanto Subprovince, *Bacani 17048*.

Distribution: Nepal, Nilghiri, Ceylon, Java, Formosa.

On humus. The leaves vary so much in outline in the same tuft or even on the same stem that any attempt to distinguish the forms in this manner seems futile. I have therefore referred all the local collections to *B. ramosum* in a broad interpretation of the species.

55. Genus RHODOBRYUM (Schimp.) Limpr.

Bryum subgenus 3, *Rhodobryum* SCHIMP., Syn. ed. 1 (1860) 351.
Rhodobryum (Schimp.) LIMPR., Laubm. 2 (1892) 444.

Large stoloniferous plants in extensive lax mats. Stems erect from subterraneous stolons, naked below or with small, appressed leaves, upper leaves larger, usually in a conspicuous terminal rosette, long-spathulate, serrate above; costa tapering from a broad base, ending in or near apex. Setæ often 2 or 3 from one perichætium; capsules large, pendulous; peristome large.

Key to the species of Rhodobryum.

Comal leaves crowded in a spreading rosette, upper leaf cells narrowly hexagonal .... 1. *R. giganteum.*
Stems equally foliate, upper leaves not in a rosette, leaf cells oval-hexagonal .... 2. *R. Curranii.*

1. RHODOBRYUM GIGANTEUM (Hook.) Schimp. Plate 11, fig. 117.

Rhodobryum giganteum (Hook.) SCHIMP., Syn. ed. 2 (1876) 464.
Bryum giganteum HOOK. in Schwaegr., Suppl. 2 pt. 2 fasc. 1 (1826) 20, *pl. 158*.

Synoicous and dioicous; large conspicuous deep-green plants in loose tufts or mats. Stems erect, densely radiculose below. Lower leaves small, scattered, appressed, the upper abruptly much larger, widely spreading to form a broad terminal rosette, flexuose when dry, spathulate from a narrow base, short-acuminate, up to 15 mm long; margins narrowly recurved below, spinose-serrate in upper half with teeth often in pairs; costa broad below, ending just below apex; cells long-hexagonal, up to 25 μ wide, narrower toward margins in several rows, rectangular at base with marginal rows narrower. Setæ often clustered, up to 8 cm long; capsules large, pendulous, up to 9 mm long, oblong cylindric with a short neck; peristome large, perfect; lid conic, bluntly apiculate.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1703*; Pauai, *McGregor 8877*: Bontoc Subprovince, Mount Pukis, *Ramos & Edaño 37776*; Bauco, *Vanoverbergh 1734*: Ifugao Subprovince, Mount Polis, *McGregor 20319*: Laguna Province, Mount San Cristobal, *Copeland "A"*; Mount Banahao, *Merrill 7520*. NEGROS, Canlaon Volcano, *Merrill 6834*.

Distribution: Himalayas, Sumatra, Java, Borneo, China, Japan, Hawaii.

On ground and logs in forests. A beautiful plant that will command attention by the broad terminal leafy rosettes.

2. RHODOBRYUM CURRANII Broth. Plate 11, fig. 174.

Rhodobryum Curranii BROTH., Philip. Journ. Sci. § C 5 (1910) 148.

Dioicous; fairly robust plants in lax tufts, dull green. Stems simple, up to 3 cm long, erect, flexuose, tomentose below, equally foliate. Leaves crowded, shrunken and contorted when dry, erect-spreading when moist, spathulate from a short base, short-acuminate, about 5 mm long; margins sharply serrate in upper half, recurved on one side below; costa broad below, tapering quickly upward, percurrent or short-excurrent; cells short, hexagonal, thin-walled, 25 μ wide and 1½ to 2 times as long, several rows at margins elongate to form a narrow, indistinct border, basal cells rectangular. Fruit unknown.

LUZON, Benguet Subprovince, Baguio, *Curran 15635*.

Distribution: Malay Peninsula.

Additional local collections of this species will be very welcome. The type specimen is scanty and in rather poor condition. It is clearly distinct from *R. giganteum* but may have other affinities that are not now apparent.

11. Family MNIACEÆ

Fairly robust, broad-leaved plants forming lax mats or patches. Fertile stems erect with upper leaves crowded in rosulate tufts, sterile branches often prostrate and equally foliate. Leaves crispate when dry, oblong, short-pointed, usually bordered; margins serrate with single or paired teeth; costa stout, percurrent; cells short, smooth, hexagonal, parenchymatous. Seta terminal, elongate; capsule horizontal or erect; peristome double, cilia, when present, nodose; calyptra small, cucullate, naked except in *Orthomnium;* lid rostrate in local species.

Key to the genera of Mniaceæ.

Capsules erect .... 56. *Orthomnium.*
Capsules horizontal or pendulous .... 57. *Mnium.*

56. Genus ORTHOMNIUM Wils.

Orthomnium Wils., Kew Journ. Bot. 9 (1857) 368.

Dioicous; rather robust, densely matted plants. Stems creeping, thickly clothed with reddish tomentum, branches erect, densely foliate. Leaves curled and twisted when dry, spathulate, apiculate, bordered; margins erect, entire; costa ending near apex; cells oval-hexagonal, smooth, rectangular below. Seta erect, fleshy, slightly scabrous; capsule long-exserted, erect, ovoid; annulus none; peristome double, teeth papillose, inner peristome rudimentary, consisting of a low papillose basal membrane without segments or cilia; lid rostrate; calyptra cucullate, densely pilose; spores large.

Key to the species of Orthomnium.

Leaves spathulate, elongated basal cells numerous, costa ending well below apex .... 1. *O. Loheri.*
Leaves abruptly widened from a very short base, elongated basal cells few, costa nearly percurrent .... 2. *O. stolonaceum.*

1. ORTHOMNIUM LOHERI Broth. Plate 12, fig. 175.

Orthomnium Loheri Broth., Oefv. Finska Vet.-Soc. Foerh. (14) 47 (1904–1905) 8.

Dull-green or yellowish plants in dense mats. Stems prostrate, densely tomentose, branches erect, about 1 cm long. Leaves crowded, erect-spreading when moist, up to 7 mm long, spathulate, rounded or minutely apiculate at apex, narrowly bordered; margins entire; costa tapering upward from a broad base, ending well below apex; cells oval-hexagonal, thin-walled, 25 μ wide and 1½ to 2 times as long, laxer, elongate and rectangular below. Seta solitary, fleshy, yellow, slightly pustulose; capsule erect, narrowly ovoid, small-mouthed, abruptly contracted to seta; peristome double, teeth pale, narrow and densely papillose, inner peristome a low basal membrane, sinuose on edges without segments or cilia; lid conic-rostrate; calyptra large, pilose with long, erect, yellow, crispate hairs; spores papillose, 60 to 85 μ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Clemens 51907a, 51908a*; Baguio, *Merrill 7843, 7845, 7855, 7875, 7887*; *Williams 1080*, *Elmer 6847*; Pauai, *Copeland 1341*; Mount Pulog, *Merrill 6399*; mountain trail, *Ramos & Edaño 45158*: Bontoc Subprovince, *Vanoverbergh 597, 796, 1077*.

Endemic.

On trees in the mountains. This attractive plant has not yet been found outside of Luzon. It has somewhat the appearance of a *Mnium*, but fruits abundantly and is easily recognized by the erect capsules and pilose calyptræ.

2. ORTHOMNIUM STOLONACEUM Broth. Plate 11, fig. 160.

Orthomnium stolonaceum BROTH., Philip. Journ. Sci. § C 3 (1908) 20.

Robust plants. Sterile stems elongate, prostrate, radiculose, laxly complanate-foliate. Leaves lightly contorted when dry, widely spreading when moist, abruptly oblong-ovate from a very short, constricted base, broadly rounded or emarginate at apex, up to 6 mm long, narrowly bordered with a single row of elongate, pellucid cells; margins plane, minutely and distantly crenulate; costa ending in or just below apex; cells oval-hexagonal, thin-walled, up to 45 µ wide and 1 to 2 times as long, smaller near apex and more elongate at extreme base. Fruit unknown.

LUZON, Tayabas Province, Bobayet Valley, *Leiberg 1246*. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens "A."*

Endemic.

This must remain an unsatisfactory species until the sporophyte is available. The plants have much the appearance of some forms of *Mnium rostratum* but the costa in section shows an almost homogeneous structure of uniformly lax cells with a small central strand, as in *Orthomnium*.

57. Genus MNIUM Hedw.

Mnium HEDW., Sp. Musc. (1801) 188.

Robust plants with the characters of the family. Leaves oblong, obtuse, bordered; margins toothed above. Setæ often in clusters of 2 or 3; capsules oblong-ovoid, subpendulous; lid rostrate; peristome double; cilia of inner peristome nodose.

Key to the species of Mnium.

Leaf margin denticulate with short, blunt teeth.................. 1. *M. rostratum*.
Leaf margin subentire.. 2. *M. integrum*.

8. MNIUM ROSTRATUM Schwaegr. Plate 11, fig. 151.

Mnium rostratum SCHWAEGR., Suppl. 1 pt. 2 (1816) 136.

Synoicous; fertile stems erect, about 2 cm high, branches long, complanate-foliate, prostrate. Leaves slightly crisped when dry, oblong or obovate, rounded at apex and short-apiculate, up to 7 mm long, bordered all around with 3 or 4 rows of elongated thickened cells; costa percurrent; cells rounded-hexagonal, slightly collenchymatous, about 25 μ wide, larger along costa and at base; margins serrate with blunt, single teeth above, entire below. Setæ solitary or clustered, reddish, 2 cm long or longer; capsule horizontal or pendulous, oblong-oval, pale brown; peristome teeth yellow; annulus broad; lid long-rostrate from a conic base.

LUZON, frequent in the mountain regions. MINDORO, Mount Halcon, *Merrill 5740*.

Distribution: Cosmopolitan in temperate and tropical countries.

On rocks and banks in elevated regions. A variable species of wide distribution. So far this species has not been collected south of Mindoro, but it should occur in the higher areas of Mindanao.

9. MNIUM INTEGRUM Bryol. Jav. Plate 11, fig. 152.

Mnium integrum Bryol. Jav. 1 (1861) 153, *pl. 122*.

Dioicous; sterile stems elongate, prostrate, radiculose, laxly foliate. Leaves slightly undulate and crispate along margins when dry, oblong, rounded at base and apex, minutely apiculate, bordered with 3 or 4 rows of elongated cells in one layer; margins entire or nearly so; costa ending in apex; cells clearly in oblique rows, oval-hexagonal, slightly colenchymatous, 25 to 35 μ wide and 1 to 1½ times as long, slightly smaller toward margins. Sporophyte unknown.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 1060, 1775*.

Distribution: Java, Sumatra.

Damp or partly submerged rocks. The presence of this species in the Philippines is none too well supported by these collections, both of which are scant and poorly developed. The few good leaves available for examination agree with the description, but more and better material will be very welcome.

12. Family DREPANOPHYLLACEÆ

Stems elongate, sparsely branched, densely radiculose. Leaves in 4 rows, laterally spreading on both sides, obliquely inserted, very asymmetrical, broad and convex on one side of costa and narrow and concave on the other side; costa nearer concave side, percurrent or short-excurrent. Sporophyte terminal, seta elongate; capsule erect.

58. Genus MNIOMALIA C. M.

Mniomalia C. M., Journ. Mus. Godeffr. 5 (1873-1874) 60.

Slender, densely tufted plants. Stems elongate, laxly branched, complanate-foliate. Leaves very unequally divided by costa; obliquely ovate, abruptly apiculate; costa excurrent in a short apiculus; cells hexagonal, smooth.

MNIOMALIA SEMILIMBATA (Mitt.) C. M. Plate 11, fig. 163.

Mniomalia semilimbata (Mitt.) C. M., Journ. Mus. Godeffr. 5 (1873-1874) 60.

Drepanophyllum semi-limbatum Mitt., Linn. Soc. Journ. Bot. (1869) 194.

Dioicous; stems creeping, densely matted together with brown radicles, irregularly branched, branches short, flattened, often with clusters of brood filaments near tips. Leaves obliquely inserted, slightly contorted when dry, overlapping when moist, 1 to 1.4 mm long, broadly ovate, apiculate, very asymmetrical, entire or with a few blunt teeth near apex; costa strong, nearer narrow concave side, excurrent in a short apiculus; cells thin-walled, irregularly hexagonal, smooth, 10 to 15 μ, linear in 3 or 4 rows along convex margin forming a strong, distinct border, not or scarcely differentiated on concave margin. Sporophyte unknown.

LUZON, Tayabas Province, Mauban, Bano, *Pastrana*; Barrio Balibago, *Pastrana 8*.

Distribution: Sumatra, Borneo, New Guinea, Samoa.

The curiously inequilateral leaves, laterally spreading in one plane, will mark this species at a glance. It has a rather broad distribution but is nowhere common.

13. Family RHIZOGONIACEÆ

Slender or medium-sized plants in lax, deep tufts. Stems erect, flexuose, densely tomentose below. Leaves erect-spreading, linear-lanceolate; margins plane, often thickened and spinose-serrate; costa stout, excurrent, smooth or toothed on back; cells small, rounded, incrassate. Seta elongate, lateral from near base of stem; capsules suberect or horizontal, ovoid-cylindric; peristome normally double, as in *Mnium*, outer peristome lacking in *Hymenodon*.

Key to the genera of Rhizogoniaceæ.

Outer peristome none, leaf cells mamillose........................ 59. *Hymenodon.*
Peristome double, leaf cells smooth........................ 60. *Rhizogonium.*

59. Genus HYMENODON Hook. f. and Wils.

Hymenodon HOOK. f. & WILS., Lond. Journ. Bot. (1844) 540.

Dioicous; slender, pale-green plants without lustre, densely tufted. Stems erect, up to 2.5 cm long, branched near densely tomentose base. Lower leaves minute, gradually larger upward, upper leaves erect or slightly spreading, ovate-lanceolate, unbordered; margins plane, bluntly toothed above; costa excurrent in a long, smooth, concolorous hairpoint; cells rounded, mamillose. Seta slender, elongate; capsule suberect, ovoid; outer peristome none, inner peristome pale, composed of 16 narrowly lanceolate segments from a low basal membrane; lid conicrostrate.

Key to the species of Hymenodon.

Leaves ovate-lanceolate, cells faintly mamillose........................ 1. *H. sericeus.*
Leaves narrowly lanceolate, cells coarsely mamillose.... 2. *H. angustifolius.*

1. HYMENODON SERICEUS (Doz. and Molk.) C. M. Plate 11, fig. 191.

Hymenodon sericeus (Doz. & Molk.) C. M., Bot. Zeit. (1847) 803.
Mielichhoferia sericea DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 312.

Dioicous; male plants minute, attached to tomentum of fertile stems. Densely tufted plants, matted together with tomentum near base. Stems with numerous slender, flexuose, basal branches, naked or with scattered minute leaves below. Upper leaves ovate-lanceolate, 1 to 1.5 mm long, abruptly contracted to a long, entire, concolorous hairpoint formed by excurrent costa; margins plane, bluntly toothed nearly to base; cells strongly incrassate, rounded-quadrate, about 10 μ, mamillose on both sides. Perichætial leaves reddish, ovate, sharply acuminate; seta pale, curved, 1 to 1.5 cm long; capsule nearly erect, ovoid, urn 1 mm long; annulus none; lid conic-rostrate, as long as urn; outer peristome none, endostome of 16 narrow segments from a low membrane; spores papillose, 15 to 20 μ.

LUZON, Laguna Province, Mount Maquiling, *Robinson 17027*: Benguet Subprovince, *Curran, Merritt, & Zschokke 16405*. NEGROS, Canlaon Volcano, *Merrill 6883*.

Distribution: Java, Borneo, Celebes.

On trees and rocks in the mountains; infrequent. Delicate, slender plants with the habit of *Rhizogonium* but smaller and easily recognized by the hair-pointed leaves and mamillose cells apart from the unusual peristome structure.

2. HYMENODON ANGUSTIFOLIUS Lac. Plate 11, fig. 135.

Hymenodon angustifolius Lac., Sp. Nov. Musc. Archip. Ind. (1871) 8, pl. 560.

Slender plants, resembling *H. sericeus* in habit and appearance but with narrower, linear-lanceolate leaves; cells not so uniformly incrassate. Seta up to 2 cm long; capsules oblong-ovoid, pale brown, urn 1.5 mm long; lid oblique; endostome composed of 16 narrow, more or less perforate segments from a low basal membrane; spores 12 to 14 μ.

MINDANAO, Sax River, *Williams 2382*.

Distribution: Celebes.

On tree fern. Rare and known only from the single fruiting collection.

60. Genus RHIZOGONIUM Brid.

Rhizogonium Brid., Bryol. Univ. 2 (1827) 664.

Medium-sized plants growing in deep tufts. Stems erect, branched from near tomentose base. Leaves laxly erect with incurved points when dry, linear-lanceolate, with a strong, thickened border which is spinose-serrate with teeth often in pairs; costa excurrent, toothed on back above; cells rounded, incrassate, smooth. Seta elongate, lateral from near base; capsules inclined, asymmetrical; peristome double, basal membrane of endostome high, segments narrow, cilia nodose.

Key to the species of Rhizogonium.

Synoicous, leaves not narrowed below.............................. 1. *R. spiniforme*.
Dioicous, leaves narrowed to insertion.............................. 2. *R. longiflorum*.

1. RHIZOGONIUM SPINIFORME (Hedw.) Bruch. Plate 11, fig. 136.

Rhizogonium spiniforme (Hedw.) Bruch, Flora (1846) 134.

Hypnum spiniforme Hedw., Sp. Musc. (1801) 236.

Synoicous and autoicous; flowers basal. Yellowish-green or brown plants in deep tufts, matted together with tomentum at base. Stems flexuose, up to 5 cm long, usually branched from base. Leaves more rigidly spreading when moist, small below, quickly enlarged upward, narrowly linear-lanceolate, gradually acuminate, carinate-concave, up to 8 mm long; margins thickened, spinose-serrate with paired teeth from near base; costa brown, very strong, toothed on back above; cells oval or rounded, incrassate, smooth, several rows at margins in 2 layers forming a thickened border. Perichaetial leaves small; seta slender, flexuose, up to 7 cm long; capsules inclined or horizontal, ovoid-cylindric, lightly furrowed when dry; peristome large; annulus broad; lid obliquely conic-rostrate.

Rotten logs, exposed tree roots, banks, and similar places. A very common, widely distributed species, probably frequent on all the islands.

Distribution: Cosmopolitan in tropical and subtropical regions.

Many forms and varieties of this well known species have been described, but none of them are sharply defined or very satisfactory.

2. RHIZOGONIUM LONGIFLORUM (Mitt.) Jaeg. Plate 11, fig. 187.

Rhizogonium longiflorum (Mitt.) JAEG., Adumbr. 1 (1873–1874) 685.
Pyrrhobryum longiflorum MITT., Journ. Linn. Soc. Bot. 10 (1868) 174.

Closely resembling *R. spiniforme* but apparently uniformly dioicous; male flowers basal on separate stems mixed with fertile plants. Leaves usually more distinctly narrowed to insertion. Perichaetial leaves up to 4.5 mm long, abruptly narrowed from a short, ovate base to a long, spinose-serrate, aristate point; seta slender, 4 cm long or longer; fruit as in *R. spiniforme*.

PANAY, Capiz Province, *Edaño 46381, 46382*. NEGROS, Negros Occidental Province, Gimagaan River, *Whitford 1457*.

Distribution: Borneo.

On logs and humus in forests; rare. This species can scarcely be distinguished from *R. spiniforme* except by a careful examination of the flower buds. The leaves are usually more narrowed toward the base, but this distinction is often slight and hard to demonstrate. If *R. badakense* Fleisch. proves to be the same plant, as suggested by Dixon, the distribution will include Java and China.

14. Family HYPNODENDRACEÆ

Distinctive, handsome plants with a frondose habit. The branches are clustered at the top of a tall, erect, woody stipe.

Dioicous; usually robust plants, often with a metallic lustre. Primary stems creeping, rhizomatous, secondary stems erect, woody, naked or tomentose below, branches crowded near the top and often forming a frondlike head. Lower leaves of stipes small, upper and branch leaves large, ovate, acuminate, sharply serrate; costa often toothed on back, excurrent; cells elongate, smooth or minutely papillose at apical angles. Seta elongate;

capsules large, nodding or horizontal, often furrowed; peristome double, perfect, cilia of endostome nodulose.

Key to the genera of Hypnodendraceæ.

Frond leaves large, ovate, complanate, smooth.............. 61. *Hypnodendron.*
Frond leaves small, ovate-lanceolate, not complanate, striate when dry.
62. *Mniodendron.*

61. Genus HYPNODENDRON Mitt.

Hypnodendron MITT. in Seemann, Fl. Vit. (1873) 401.

Robust, dendroid plants laxly associated in colonies. Secondary stems naked or tomentose only at extreme base, branches crowded at top of stipe, usually flattened, forming a more or less dense frond. Stipe leaves small, scattered, erect or squarrose-recurved, upper leaves large, more or less complanate, ovate, sharply serrate with single or paired teeth; costa ending in or near apex, toothed on back above; cells linear, smooth, often minutely papillose by projecting ends, scarcely differentiated at basal angles. Capsules large, nodding, on elongate setæ; lid long-rostrate; peristome double.

Key to the species of Hypnodendron.

1. Stipe leaves entire, erect spreading.. 3. *H. vitiense.*
   Stipe leaves sharply serrate, squarrose-recurved.................................... 2.
2. Branch leaves dimorphous, ventral row much smaller than lateral rows.
   4. *H. Copelandii.*
   Branch leaves not dimorphous .... 3.
3. Branch leaves short-acuminate, capsule lightly ribbed.. 2. *H. arborescens.*
   Branch leaves long-acuminate, capsule strongly ribbed 1. *H. Reinwardtii.*

1. **HYPNODENDRON REINWARDTII** (Hornsch.) Lindb. Plate 12, fig. 180.

Hypnodendron Reinwardtii (Hornsch.) LINDB., Bryol. Jav. 2 (1865) 135, *pl.* 233.

Hypnum Reinwardtii HORNSCH., Nov. Act. Acad. Caes. Leop. 14 Suppl. 2 (1828) 722.

Secondary stems longer than in *H. arborescens*, up to 9 cm long, with a more open, lax frond; branches flattened, usually blunt but occasionally with numerous long laxly leaved flagelliform branchlets. Frond leaves up to 4 mm long or longer, ovate-lanceolate, gradually long-acuminate, coarsely serrate with teeth occasionally in pairs. Setæ 2 or 3 to a plant, up to 6 to 7 cm long; capsule suberect, cylindric, strongly ribbed, urn up to 7 mm long; lid long and finely beaked, shorter than urn.

BATAN, Santo Domingo de Basco, *Fenix 3849*, a form with short setæ and flagelliform branchlets; Mount Iraya, *Ramos 79815*, a form similar to the preceding. LUZON, Laguna Prov-

46. Genus FUNARIA Hedw.

Funaria HEDW., Sp. Musc. (1801) 172.

Autoicous; male flower terminal on a branch from near base of stem. Small plants with the characters of the family.

Key to the species of Funaria.

Capsule smooth, peristome simple	1. *F. luzonensis.*
Capsule sulcate, peristome double	2. *F. calvescens.*

1. FUNARIA LUZONENSIS Broth. Plate 9, fig. 147.

Funaria luzonensis BROTH., Philip. Journ. Sci. § C 3 (1908) 19.

Small, densely gregarious plants, dull yellowish green. Stems erect, 3 to 4 mm high, naked and radiculose below. Comal leaves erect-spreading, oblong-ovate, concave, abruptly acuminate, 1.5 to 2 mm long; margins erect, serrulate in upper half; costa rather strong, ending below apex in base of acumen; upper cells oval-hexagonal, 20 to 30 μ wide, gradually more elongate below, basal cells rectangular, bordered all around with one row of narrower, linear or rhomboidal, pellucid cells. Seta very slender, erect, yellow, up to 15 mm long; capsule smooth, suberect, ovoid with a long tapering neck, contracted below mouth when dry; peristome simple, teeth short, distant, striolate, inserted below rim; lid planoconvex; calyptra pale, much inflated below; spores papillose, 30 to 40 μ.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4929;* Mount Tonglon, *Merrill 4834* (type); Baguio, *Williams 1830;* Pauai, *Mearns 4552.*

Endemic.

Distinguished at a glance from *F. calvescens* by the smooth, suberect capsules.

2. FUNARIA CALVESCENS Schwaegr. Plate 9, fig. 148.

Funaria calvescens SCHWAEGR., Suppl. 1 pt. 2 (1816) 77.

Gregarious in patches, often on burned, sterile ground. Stems up to 1 cm high, erect. Lower leaves small, comal leaves erect, concave, oblong-ovate, short-pointed; margins erect, entire; costa nearly percurrent; cells lax, hexagonal or rhomboidal, narrower toward margins. Seta slender, flexuose, up to 5 cm long; capsule pale or brownish, pyriform, asymmetrical, curved, rounded on back, deeply sulcate when dry, mouth oblique; peristome double, segments of endostome shorter than oblique teeth; annulus broad, spores 12 to 15 μ.

Distribution: Ceylon, Sumatra, Java, Celebes, Borneo, New Guinea, Fiji.

On trees in damp forests. Usually a smaller plant than *H. Reinwardtii* with a more compact frond, shorter pointed branch leaves, and more lightly ribbed capsules. Some of the larger forms with leaves of an intermediate shape are, I must confess, not always easy to separate with satisfaction. I have seen no fruiting plants with smooth capsules that could be definitely referred to *H. Beccarri* of Borneo.

3. HYPNODENDRON VITIENSE Mitt. Plate 12, fig. 192.

Hypnodendron vitiense MITT. in Seemann, Fl. Vit. (1865–1873) 401.

Secondary stems up to 8 cm high, naked except at extreme base, branches crowded above in a short, wide frond, golden green with a metallic sheen. Stipe leaves erect-spreading, triangular-ovate, acuminate, minutely denticulate or subentire. Frond leaves complanate, ovate, short-acuminate, 2.5 mm long, sharply spinose-serrate with teeth often in pairs; costa percurrent or short-excurrent, distantly toothed on back in upper half; cells narrowly linear, 3 to 5 μ wide, faintly papillose on back by projecting ends. Setæ up to 4 to 5 to a plant, 2 to 2.5 cm long, flexuose; capsules inclined, ribbed when dry, urn 4 mm long; lid conic-rostrate, oblique, 2 mm long.

LUZON, Benguet Subprovince, Pauai, *McGregor 8681*; Baguio, *Williams 1866*: Laguna Province, Mount Maquiling, *Robinson 17094*, *Hadden 123*, *Elmer 18359*. NEGROS, Canlaon Volcano, *Merrill 6816* in fruit. MINDANAO, Davao Province, Mount Apo, *Williams 3169* in fruit.

Distribution: Fiji, Solomon Islands.

On trees and rocks in mountain forests. These collections agree closely with Seemann's plants from Fiji which I have seen through the kindness of Mr. Williams. The Mount Maquiling collections are smaller and more laxly branched, but otherwise typical. I have not seen *H. formosicum* Card., to which Brotherus has referred the Philippine collections, but there is little question in my mind about combining the local plants with *H. vitiense*.

4. HYPNODENDRON COPELANDII Broth. Plate 12, fig. 193.

Hypnodendron Copelandii BROTH., Oefv. Finska Vet.-Soc. Foerh. (14) 47 (1904–1905) 11.

Secondary stems up to 8 cm high. Stipes with scattered tufts of reddish tomentum below, naked above; stipe leaves squarrose-recurved from a broadly reniform clasping base abruptly contracted to a finely acuminate point; margins strongly serrate. Branches flattened, crowded in a broad frond, leaves complanate, dimorphous, lateral rows spreading, ovate, short-acuminate, up to 1.5 mm long, coarsely serrate with single teeth; costa ending just below apex, toothed on back above; cells linear, 6 to 7 μ wide and 5 to 6 times as long; ventral row of leaves smaller, erect, appressed. Setæ 3 or 4 to a plant, red, up to 5 cm long; capsules horizontal, oblong-cylindric, ribbed, are 4 to 5 mm long; lid 2 mm long, bluntly pointed.

MINDANAO, Davao Province, Mount Apo, *Copeland 1020* (type); *Williams 2659*.

Distribution: Java, Borneo, Annam.

On trees in high forests; rare. A fine plant, easily recognized by the dimorphous branch leaves with the ventral row much smaller than the lateral rows and erect-appressed.

62. Genus MNIODENDRON Lindb.

Mniodendron LINDB. in E. & P. Pflanzenfam. ed. 1 Musci 11 (1909) 1170.

Robust plants with rigid, dendroid secondary stems, usually but not consistently densely tomentose up to base of frond. Branches crowded at top of stipe in a flabelliform frond. Stipe leaves scattered; frond leaves ovate-lanceolate, crowded, spreading on all sides, usually striate when dry, concave or channeled, coarsely serrate; costa percurrent or excurrent, distantly toothed on back; cells smooth, elongate, slightly incrassate. Setæ elongate; capsules large, horizontal or pendulous, cylindric, ribbed; lid long-rostrate.

The stipes are not uniformly tomentose, and this feature cannot be relied upon to separate *Mniodendron* from *Hypnodendron*. The genera are separated in deference to the distinctions maintained by Fleischer and Brotherus, but it would seem to be more practical to combine them in one group, which will probably be the eventual policy. The frond leaves supply the most satisfactory character for distinguishing the genera as far as the Philippine plants are concerned.

Key to the species of Mniodendron.

1. Branch leaves with a narrow, thickened border.......... 1. *M. Korthalsii*.
   Branch leaves not bordered.. 2
2. Branch leaves 2.5 to 3 mm long, stipes usually densely tomentose.
   2. *M. divaricatum*.
   Branch leaves 1 to 1.5 mm long, stipes sparsely tomentose or naked.
   3. *M. fusco-mucronatum*.

1. **MNIODENDRON KORTHALSII** Bryol. Jav. Plate 12, fig. 192.

Mniodendron Korthalsii Bryol. Jav. 2 (1865) 139, *pl.* 236.

Mniodendron mindanense BROTH., Leafl. Philip. Bot. 6 (1913) 1975.

Secondary stems up to 10 cm high, naked except at extreme base; branches elongate with lateral branchlets, forming a large, lax, fanlike frond. Stipe leaves rather crowded, with widely spreading points, ovate-lanceolate, long-acuminate, serrate. Frond leaves erect-spreading, ovate-lanceolate, lightly plicate, long-acuminate, spinose-serrate with teeth often in pairs, up to 4 mm long; costa usually short-excurrent, remotely toothed on back; cells linear-rhomboidal, 6 to 7 µ wide and 4 to 8 times as long, with firm, pellucid walls, several rows at margins shorter, in 2 layers, forming a thickened border in upper half of leaf, laxer and rectangular at basal angles. Capsule large, horizontal, ribbed.

LUZON, Kalinga Subprovince, Lubuagan, Mount Masingit, *Ramos & Edaño 37520, 37595*: Tayabas Province, Baler, *Santos 370*: boundary between Nueva Ecija and Tayabas Province, *Santos 387*: Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15067*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 22*. MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 14191, 14315*.

Distribution: Sumatra, Java, Borneo, Celebes, Japan.

On shaded rocks and tree trunks in forests. Varying considerably in size but clearly distinguished from all other local species by the thickened border of the branch leaves. The Mindanao plants, which Brotherus calls *M. mindanense*, are so slightly different in only a comparative way that I cannot see how the name can be continued, even for a varietal distinction.

2. **MNIODENDRON DIVARICATUM** (Hornsch. and Reinw.) Lindb. Plate 12, fig. 193.

Mniodendron divaricatum (Hornsch. & Reinw.) LINDB., Oefv. Vet.-Akad. Foerh. 18 (1861) 375.

Hypnum divaricatum HORNSCH. & REINW., Nov. Act. Acad. Caes. Leop. 14 Suppl. 2 (1827) 723.

Secondary stems up to 10 cm high or higher but often shorter, usually densely clothed with reddish tomentum up to branched frond. Stipe leaves rather widely spreading, gradually long-acuminate from a triangular-ovate base, sharply serrate. Frond leaves ovate-lanceolate, gradually long-acuminate, canaliculate-concave, coarsely and irregularly serrate with single teeth, 2.5 to 3 mm long; costa percurrent or short-excurrent;

cells linear, about 5 µ wide, with firm, pellucid, slightly porose lateral walls, marginal rows shorter, laxer, shorter and rectangular at basal angles. Setæ 1 to 4 to a plant, 4 to 5 cm long; capsule ribbed, 5 to 6 mm long, cylindric.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 20328:* Bontoc Subprovince, Mount Masapilid, *Ramos & Edaño 38245:* Abra Province, *Ramos 7913:* Laguna Province, Mount Banahao, *Ocampo 28015, Simbajon 4, Robinson 6602, 9854, Curran & Merritt 7937, Calvin 830:* Zambales Province, *Ramos 5142, Curran & Merritt 8164, 8190:* Tayabas Province, Lucban, *Elmer 9289;* Baler, *Santos 224.* MINDORO, Mount Halcon, *Merrill 6185.* NEGROS, Cuernos de Negros, *Magdamo 96.* PANAY, Antique Province, *McGregor 32651, 32630:* Capiz Province, Mount Bulilao, *Martelino & Edaño 35817.* MINDANAO, Bukidnon Province, Mount Lipa, *Ramos & Edaño 37104;* Mount Batangan, *Warburg:* Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4791, 4795:* Agusan Province, *Weber 1304.*

Distribution: Sumatra, Java, Borneo, Celebes.

On trees and rocks in damp forests. Common and quite variable in size. The stipes are usually thickly clothed with tomentum, but occasionally nearly naked as in the *Hypnodendron* species.

MNIODENDRON DIVARICATUM (Hornsch. & Reinw.) Lindb. var. **WALLISII** (C. M.) Bartram comb. nov.

Hypnum Wallisi C. M., Linnaea 38 (1874) 571.

Stipes less densely tomentose. Leaves with shorter, broader points; margins less strongly serrate, teeth smaller and more remote. Setæ shorter, 2 to 2.5 cm long.

LUZON, Laguna Province, Mount Banahao, *Robinson 9818, Quisumbing 875.*

Endemic.

I have not seen the type collection. These specimens agree closely with the description but differ so slightly from *M. divaricatum* that I doubt if the species has any real value.

3. **MNIODENDRON FUSCO-MUCRONATUM** (C. M.) Broth. Plate 12, fig. 124.

Mniodendron fusco-mucronatum (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1909) 1172.

Hypnum fusco-mucronatum C. M., Bot. Zeit. (1962) 393.

Secondary stems 3 to 5 cm high, naked or sparsely clothed with scattered tufts of tomentum below the compactly branched, flabelliform frond. Stipe leaves erect, appressed, triangular, gradually narrowed to a slender, sharp acumen, minutely serrulate. Frond leaves rigidly erect-spreading, 1 to 1.5 mm long, triangular-ovate, short-acuminate, serrulate; costa percurrent or ending just below apex, toothed on back above; cells linear, with firm, pellucid walls, marginal row short and rhomboidal, lax and rectangular at basal angles. Setæ relatively short, 2 to 6 to a plant, 1.5 to 3 cm long; capsule large, horizontal, 5 mm long, ribbed near mouth or nearly smooth.

LUZON, Bataan Province, Lamao River, Mount Mariveles, *Whitford 281, Medina 22042;* Rizal Province, Mount Irig, *Ramos 49001;* Laguna Province, Mount Maquiling, *Robinson 9730, Baker 2661;* Tayabas Province, Lucban, *Elmer 7399;* Pampanga Province, Camp Stotsenburg, *Elmer 22314.* NEGROS, Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 10172.* BILIRAN, Mount Suiro, *McGregor 18458.* MINDANAO, Davao Province, trail to Mount Apo, *Copeland 076;* Mount Apo, *Williams 2658a;* Zamboanga Province, *Copeland "D"* in part.

Endemic.

On shaded rocks and earth along streams. Well distributed locally and clearly distinct from *M. divaricatum* in the erect stipe leaves, smaller branch leaves, and shorter setæ. It resembles the smaller forms of *M. Korthalsii* superficially, but in that species the stipes are uniformly naked with widely spreading leaf points, and the branch leaves are much larger with thickened, spinose-serrate margins.

15. Family BARTRAMIACEÆ

Plants of variable size, often with whorls of subfloral branches. Leaves lanceolate, acuminate, sharply serrate; costa percurrent or excurrent, often toothed on back; cells rectangular, papillose, seldom smooth. Seta terminal, usually elongate; capsules subglobose, erect or inclined, furrowed; peristome none or double, endostome often rudimentary; lid short, broadly conical, usually flat when dry.

Key to the genera of Bartramiaceæ.

1. Seta short, capsules immersed................................ 63. *Leiomela.*
Seta elongate, capsules exserted................................ 2.
2. Capsules smooth, tapering to a long neck................ 65. *Fleischerobryum.*
Capsules furrowed, without a distinct neck................................ 3.
3. Alar cells differentiated, leaves plicate at base................ 66. *Breutelia.*
Alar cells not differentiated, leaves not plicate................ 64. *Philonotis.*

63. Genus LEIOMELA (Mitt.) Broth.

Leiomela (Mitt.) Broth., E. & P. Pflanzenfam. ed. 1 Musci (1904) 634.

Bartramia subsection *Leiomela* Mitt. in part, Journ. Linn. Soc. 12 (1869) 253.

Synoicous; robust pale or yellowish-green plants without lustre, densely tufted. Stems erect, branched, thickly clothed with brown tomentum. Leaves erect-spreading, narrowly linear, gradually very long and slenderly acuminate, serrulate nearly to base; costa long excurrent in a denticulate hairlike point; cells narrowly rectangular, strongly papillose at apical angles. Perichætial leaves longer than stem leaves; seta terminal, very short; capsule ovoid, erect, smooth; peristome teeth 16, deeply inserted, more or less split along median line, smooth, endostome very rudimentary; lid nearly flat.

LEIOMELA JAVANICA (Ren. and Card.) Broth. Plate 12, fig. 125.

Leiomela javanica (Ren. & Card.) Broth., E & P. Pflanzenfam. ed. 1 Musci (1904) 635.

Cryptopodium javanicum Ren. & Card., Rev. Bryol. (1896) 100.

Tall, branched plants up to 6 cm high or higher, compactly matted together below with brown tomentum. Leaves linear, 6 to 8 mm long, gradually narrowed to a fine, denticulate setaceous point; margins plane, denticulate almost to base with small teeth which are often in pairs above; costa long-excurrent, scabrous on back; upper cells narrowly rectangular, irregularly bistratose, strongly unipapillate near apical angles, basal cells linear, smooth, with firm pellucid walls. Perichætial leaves longer than stem leaves, cells smooth; capsule ovoid, erect, smooth, on a short seta scarcely 1 mm long; peristome double, endostome very rudimentary; spores papillose, 26 to 30 μ.

LUZON, Benguet Subprovince, Mt. Pulog, *McGregor 8003*.

Distribution: Java.

On trees in forest. The plants in this collection are sterile but the vegetative characters are thoroughly distinctive. The description of the sporophyte is from Fleischer's *Musc. Archip. Ind. No. 99*.

64. Genus PHILONOTIS Brid.

Philonotis Brid., Bryol. Univ. 2 (1827) 15.

Usually slender, paludal plants in moderately dense tufts or mats. Stems mostly elongate, laxly erect, with subfloral whorls of innovations, often densely tomentose below. Leaves ovate-lanceolate, acuminate; margins toothed; costa percurrent or excurrent; cells rectangular, normally sharply papillose near apical or basal walls. Seta solitary, terminal, erect, elongate; capsule subglobose, strongly furrowed when dry; peristome double or none; lid broadly convex or flat.

Key to the species of Philonotis.

1. Capsule erect, peristome none or single .... 2.
   Capsule nodding or horizontal, peristome double .... 3.
2. Peristome none .... 1. *P. Roylii.*
   Peristome single .... 2. *P. tjibodensis.*
3. Leaf cells lax, nearly smooth .... 4.
   Leaf cells firm, sharply papillose .... 5.
4. Leaves narrow, costa long-excurrent .... 7. *P. mollis.*
   Leaves relatively broad, costa ending below apex .... 4. *P. laxissima.*
5. Very robust plants, leaves broad, cells very long and narrow. 8. *P. speciosa.*
   Smaller plants with narrow leaves, cells shorter and broader .... 6.
6. Very slender plants, leaves less than 1 mm long .... 3. *P. imbricatula.*
   Larger plants, leaves over 1 mm long .... 7.
7. Leaf margins plane .... 9. *P. falcata.*
   Leaf margins recurved .... 8.
8. Leaf margins slightly revolute, leaf cells elongate, narrowly rectangular or linear .... 5. *P. secunda.*
   Leaf margins strongly revolute, leaf cells shorter and more uniformly rectangular .... 6. *P. revoluta.*

1. PHILONOTIS ROYLII (Hook. f.) Mitt. Plate 11, fig. 196.

Philonotis Roylii (Hook. f.) Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 60.

Glyphocarpa Roylii Hook. f. in Hook. Icon. Pl. rar. 2 (1841) *pl. 04.*

Synoicous; small, gregarious, dull-green plants. Stems slender, erect, up to 1 cm long, with several subfloral innovations of about same length. Leaves erect or slightly secund, lanceolate, long and slenderly acuminate, 1.5 mm long; margins erect, sharply serrulate; costa long-excurrent in a strongly toothed aristate point; upper cells narrowly rectangular, 6 to 8 μ wide and 4 to 6 times as long, smooth or faintly papillose at upper end, shorter and broader at base and subquadrate at basal angles. Seta slender, erect, 10 to 12 mm long; capsule erect, subglobose, wrinkled when dry; peristome none; lid broadly convex.

LUZON, Benguet Subprovince, Bued River, *Merrill 4899.*

Distribution: Himalayas, Ceylon. On wet, shaded banks.

2. PHILONOTIS TJIBODENSIS (Fleisch.) Broth. Plate 17, fig. 197.

Philonotis tjibodensis (Fleisch.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1904) 645.

Bartramidula tjibodensis FLEISCH., Laubm. Java 2 (1904) 607.

Dioicous; small, dull yellowish-green plants in dense tufts. Stems 1 to 2 cm high, radiculose below, with slender subfloral innovations. Leaves crowded, narrowly lanceolate, gradually acuminate, 1 to 1.2 mm long; margins narrowly recurved, sharply serrulate, with paired teeth; costa excurrent, strongly toothed on back; cells 7 to 8 µ wide and 4 to 5 times as long, papillose at apical angles, shorter and broader below. Seta slender, erect, 1.5 to 2 cm long; capsule subglobose, small-mouthed, 1.5 mm long, wrinkled when dry; peristome single, composed of 16 short, pale-brown, nearly smooth, rudimentary teeth about 80 µ high; lid nearly flat; spores papillose, 20 to 25 µ.

LUZON, Tayabas Province, Mount Binuang, *Ramos & Edaño 28989*: Benguet Subprovince, Trinidad, near Baguio, *Williams 1872*; Baguio, *Curran 15684*; Nueva Vizcaya Province, Santa Fé, *Cabuat 1*. MINDANAO, Zamboanga Province, near San Ramon, *Williams 2890*. CAMIGUIN DE MINDANAO, *Ramos 14891*.

Distribution: Java.

On damp, shaded banks. These collections all differ from *P. Griffithiana* (Wils.) Mitt. in the more or less secund leaves with the costa usually long-excurrent and the rudimentary peristome teeth nearly smooth on the outer face.

3. PHILONOTIS IMBRICATULA Mitt. Plate 17, fig. 198.

Philonotis imbricatula MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 61.

Dioicous; male flower gemmiform. Small, slender plants, in lax or dense tufts, dull yellowish green. Fertile stems less than 1 cm high with numerous subfloral innovations. Leaves erect, closely imbricated, 0.5 to 0.7 mm long, ovate-lanceolate, short-acuminate; margins narrowly recurved, serrulate; costa percurrent, basal cells subquadrate, up to 10 µ wide, upper cells narrowly rectangular with firm colorless walls, papillose at upper ends. Seta erect, 1 cm long; capsule horizontal, furrowed, 1.5 mm long; peristome double; lid short, conic.

LUZON, Benguet Subprovince, between Baguio and Sablan, *Williams 1870*: Cavite Province, Naic, *Bartlett 14565*; Silang and Balete, *Bartlett 14766*.

Distribution: Ceylon, Hongkong, Fiji.

On damp rocks. The very slender, almost terete stems and small appressed leaves will identify this species.

4. PHILONOTIS LAXISSIMA (C. M.) Bryol. Jav. Plate 12, fig. 191.

Philonotis laxissima (C. M.), Bryol. Jav. 1 (1861) 164, *pl. 124*.
Bartramia laxissima C. M., Syn. 1 (1849) 480.
Bartramia Wallisi C. M., Linnæa 38 (1874) 654.

Dioicous; male flowers gemmiform. Slender pale-green plants in small, dense tufts. Stems up to 1.5 cm long, laxly erect. Leaves erect-spreading, with incurved points, rarely slightly secund, 1.5 mm long, lanceolate, short-acuminate; margins slightly reflexed, bluntly serrulate with teeth in pairs above; costa percurrent or ending below apex, denticulate on back; cells lax and nearly smooth, upper 10 to 12 µ wide and 2 to 4 times as long, marginal rows at basal angles short and rounded. Seta 1 to 2 cm long; capsule inclined, furrowed; peristome double; lid broadly convex, apiculate.

LUZON, Rizal Province, *Curran 10041* bis.; Hinulugan Taktak (waterfall), *Bartlett 15243, 15244, 15250, 15264, 15288;* Zambales Province, Olongapo, Mount Kabalan, *Ebulo 28;* Laguna Province, Nagcarlan, *Bartlett 15201;* Majayjay, reg. montosa, *Wallis:* Tayabas Province, Mauban, Bano, *Pastrana 28, 32, 38;* Barrio Malasor, *Pastrana 79, 84;* Barrio Balibago, *Pastrana 12:* Cavite Province, Silang and Balete, *Bartlett 14784, 14796.* CEBU, Labug, *Nemenzo 11, 12, 13, 14.*

Distribution: Madagascar, Siam, Sumatra, Java, Borneo, Hawaii.

On damp ground and wet rocks. The laxly areolate, short-pointed leaves of *B. Wallisi* differ in no way from some of the forms of *P. laxissima.* Curran's *10041* bis. is in fruit and has been referred by Brotherus to *P. Wallisi* (C. M.). The sporophyte is typical of *P. laxissima,* so that I can see no reason for including *B. Wallisi* in *Fleischerobryum* as a separate species. It appears to be a form of *P. laxissima* with elongate, simple sterile stems having the leaves lightly secund. This form may be the result of an unusual habitat.

5. PHILONOTIS SECUNDA (Doz. and Molk.) Bryol. Jav. Plate 12, fig. 200.

Philonotis secunda (Doz. and Molk.) Bryol. Jav. 1 (1861) 156, *pl. 120.*

Bartramia secunda Doz. and Molk., Pl. Jungh. 1 (1854) 332.

Dioicous; male flower gemmiform, perigonial leaves abruptly acuminate from an ovate base, margins recurved below. Slender, tufted plants, usually matted together with brown tomentum. Stems suberect, up to 3 cm long. Leaves 1 to 1.5 mm long, often secund, narrowly lanceolate, gradually narrowed to a long, slender, acuminate point; margins narrowly recurved, sharply serrulate, upper teeth in pairs; costa long-excurrent, denticulate on back; upper cells linear, sharply papillose at apical angles, 2 to 3 µ wide, basal cells rectangular, 7 to 9 µ wide, usually papillose. Seta 2 to 3 cm long, red; capsule nodding or horizontal; peristome double.

LUZON, Benguet Subprovince, *Ramos 5512;* Baguio, *Williams 1871;* Pauai, *Copeland 1319, McGregor 8695;* Ifugao Subprovince, Kiangan, *McGregor 20040;* Rizal Province, Bosoboso, *Ramos 1170;* Nueva Vizcaya Province, Campote, *McGregor 20219;* Laguna Province, Mount Maquiling, *Baker 2748.* PANAY, Iloilo Province, *Robinson 18197, 18204.* MINDANAO, Agusan Province, *Weber 1308.*

Distribution: Sumatra, Java.

On damp banks and rocks. Distinguished from *P. mollis* by the smaller, more secund leaves with more uniformly recurved margins, and especially by the narrower basal cells with firm pellucid walls.

4. **PHILONOTIS REVOLUTA** Bryol. Jav. Plate 12, fig. 201.

Philonotis revoluta Bryol. Jav. 1 (1861) 158, pl. *128.*

Dioicous; male flowers gemmiform, perigonial leaves gradually long-acuminate, margins plane. Closely resembling *P. secunda* in habit, color, and structural details. Leaves more uniformly erect-spreading, not or scarcely secund, about 1.5 mm long; margins usually strongly revolute nearly to apex, upper cells 5 µ wide. Sporophyte as in *P. secunda.*

LUZON, Benguet Subprovince, *Bacani 15919;* Sablang, *Fenix 12808;* Pauai, *Merrill 6676, Copeland 1342;* Bontoc Subprovince, Bauco, *Vanoverbergh 719, 1059, 1750, 1768, 3905;* Ifugao Subprovince, Polis, *McGregor 20820, 20325;* Rizal Province, Bosoboso, *Robinson 6783;* Laguna Province, Mount Maquiling, *Elmer 18915;* Tayabas Province, Baler, *Santos 234, 347;* Zambales Province, Olongapo, *Ebalo 66, 67.*

Distribution: Sumatra, Java, Tonkin.

Wet banks and rocks. Separated from *P. secunda* by the more gradually acuminate, plane-margined perigonial leaves and the more erect-spreading, shorter-pointed stem leaves with rather wider areolation. The male flowers are scarce and hard to find, so that the majority of determinations are based on the less secund stem leaves. This is not a very satisfactory method. Either I have failed to grasp the distinctions between these two species, or the available characters are too inconstant to be of much practical value.

7. **PHILONOTIS MOLLIS** (Doz. and Molk.) Bryol. Jav. Plate 11, fig. 202.

Philonotis mollis (Doz. & Molk.), Bryol. Jav. 1 (1861) 165, *pl. 125.*
Bartramia mollis Doz. & Molk., Ann. Sci. Nat. (1844) 300.

Dioicous; male flowers discoid. Slender, yellowish-green plants in lax, soft tufts. Stems up to 4 cm long, weak, ascending, sparsely radiculose. Leaves erect or slightly spreading, narrowly lanceolate, gradually narrowed from base to a long filiform acuminate point, 1.5 to 2 mm long; margins plane or slightly reflexed above, sharply serrulate above with paired teeth; costa long-excurrent; basal cells lax, rectangular, smooth, up to 15 μ wide, upper cells linear, lightly papillose near upper ends. Seta red, up to 5 cm long; capsule nodding or horizontal; peristome double.

LUZON, Rizal Province, Bosoboso, *Ramos 16962*: Bataan Province, Olongapo Naval Reservation, *Bartlett 14116*: Lepanto Subprovince, Malaya Mountains, *Bona 149*: Laguna Province, Los Baños, *Robinson 17141*: Zambales Province, Olongapo, Mount Kabalan, *Ebalo 27*; Mount Ilingin, *Ebalo 68, 71.*

Distribution: Southern India, Sumatra, Java, Andaman Islands, Tonkin.

On damp ground. This species has not yet been found fruiting in the Philippines, but the narrow, finely acuminate and laxly areolate leaves agree perfectly with authentic specimens from other regions.

8. **PHILONOTIS SPECIOSA** (Griff.) Mitt. Plate 11, fig. 203.

Philonotis speciosa (Griff.) Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 64.
Bartramia speciosa Griff., Not. 433; Ic. Pl. Asiat. 2 (1849) *pl. 101, fig. 1.*

Dioicous; robust plants, yellowish green, glossy, in dense tufts, matted together with brown tomentum. Stems erect, up to 6 cm high, fertile plants lower with short, subfloral innovations. Leaves crowded, erect-spreading, 2.5 mm long, rigid with lightly twisted points, lanceolate, acuminate, carinate-concave; margins narrowly recurved near base, erect above, sharply serrulate; costa slender, short-excurrent; upper cells very long and narrow, 3 to 5 μ wide and 12 to 16 times as long, papillose at ends, basal cells wider, short-rectangular at basal angles. Seta 2.5 cm long; capsule large, inclined or horizontal, furrowed; peristome double, teeth brown, 0.75 mm high, segments of endostome densely papillose; spores 22 to 25 μ.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 104*. MINDANAO, Bukidnon Province, near Bihrig, *Mrs. L. H. Phillips 25*.

Distribution: Nepal, Khasia.

On wet stones. An unusually fine plant for the genus. The robust habit and leaf structure are suggestive of *Breutelia* and entirely distinct from any of the other local species.

9. PHILONOTIS FALCATA (Hook.) Mitt. Plate 12, fig. 201.

Philonotis falcata (Hook.) MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 62.

Bartramia falcata HOOK., Trans. Linn. Soc. 9 (1808) 317.

Dioicous; male flower discoid. Rather slender, dull yellowish-green plants in dense tufts, matted together with reddish tomentum below. Stems up to 5 cm high, erect, with whorled subfloral innovations. Leaves not crowded, indistinctly spirally ranked, usually falcate and hooked at tips of branches, triangular-ovate from a broad base, acuminate, carinate-concave, lightly plicate, up to 1.6 mm long; margins plane, denticulate all around; costa brown, excurrent, denticulate on the back above; upper cells narrowly rectangular, sharply papillose at one or both ends, wider and shorter below. Seta red, 2.5 to 3 cm long; capsule large, nodding, deeply furrowed; peristome double, lid planoconvex.

LUZON, Benguet Subprovince, Baguio, *Elmer 8697*, *Bacani 15984*; Bugyas, *Ramos 5927*; Pauai, *Clemens 9520*; Nueva Ecija Province, *Santos 103*.

Distribution: Northern India, China, Korea, Japan, Hawaii.

On wet ledges. Well localized in Benguet Subprovince, but probably will be found elsewhere in Luzon on wet rocks in the mountains.

65. Genus FLEISCHEROBRYUM Loeske

Fleischerobryum LOESKE in Morph. und Syst. d. Laubm. (1910) 127.

Dioicous; large plants with the habit of a robust *Philonotis*, yellowish green, glossy. Stems erect, densely felted with brown tomentum, fastigiately branched. Leaves erect-spreading, ovate-lanceolate, long-acuminate; margins serrulate; costa slender, excurrent; upper cells linear, laxer and oblong-hexagonal below.

Seta terminal, erect, elongate; capsule inclined or horizontal, oblong-ovoid, tapering to a short, distinct neck.

PLEISCHERODRYUM MACROPHYLLUM Broth. Plate 27, fig. 105.

Fleischerobryum macrophyllum BROTH., Philip. Journ. Sci. 13 (1928) 285.

Robust plants in lax tufts. Stems branched, up to 6 cm high. Leaves not crowded, erect-spreading, lanceolate, gradually narrowed to a long fine point, 3.5 to 5 mm long, almost 1 mm wide; margins usually narrowly recurved, minutely serrulate; costa slender, excurrent in a long, denticulate aristate point; basal cells lax, smooth, oblong-hexagonal, up to 25 μ wide, gradually narrower upward, upper cells linear, 5 μ wide and 10 to 12 times as long, minutely papillose at apical angles. Seta 4.5 to 5.5 cm long, curved at tip; capsule large, oblong-ovoid, smooth, about 6 mm long, tapering to seta; lid convex, apiculate; calyptra cucullate, 4 mm long; peristome unknown.

LUZON, Bontoc Subprovince, Mount Polis, altitude 6,100 feet, *Ramos & Edaño 38239*.

Endemic.

On roadside bank in forest. A beautiful moss, suggestive of a large *Philonotis* but with a very different-shaped, smooth capsule. Unfortunately the fruit is too immature to provide the peristome characters.

66. Genus BREUTELIA Schimp.

Breutelia SCHIMP., Coroll. (1856) 85.

Dioicous; male flower discoid. Usually robust plants with erect, densely tomentose, branched stems, growing in dense tufts. Leaves acuminate, plicate at base; margins serrulate; cells elongate, incrassate, well differentiated at basal angles. Seta elongate; capsule subpendulous, furrowed; peristome double.

Key to the species of Breutelia.

Very robust plants, marginal cells of leaf base large, lax, and hyaline.
2. *B. arundinifolia.*
Small, slender plants, cells of basal leaf angles small, quadrate.
1. *B. Merrillii.*

1. BREUTELIA MERRILLII Broth. Plate 11, fig. 104.

Breutelia Merrillii BROTH., Philip. Journ. Sci. 3 C 3 (1908) 21.

Rather small, slender, pale yellow, glossy plants growing in lax soft tufts. Stems erect, up to 1 cm high, with tufts of brown tomentum below, subfloral innovations few, curved, 5 to 6 mm long. Leaves erect-spreading, 3 to 3.5 mm long, lanceolate-subulate from an ovate base, piliform-acuminate, carinate-concave, lightly plicate at base; margins narrowly recurved about ⅔ up, sharply denticulate; costa slender, excurrent in a long denticulate arista; cells linear with firm pale walls, sharply papillose at apical angles, subquadrate alar cells few. Seta slender, up to 2.5 cm long; capsule short, oblong, 2 mm long, furrowed when dry; lid conic, apiculate, 0.5 mm long.

LUZON, Mountain Province, Mount Data, *Merrill 4873* (type): Benguet Subprovince, Mount Pulog, *Curran, Merritt & Zschokke 16506;* Mount Santo Tomas, *Williams 1575.*

Endemic.

On damp banks in mountain forests. An unusually small, delicate species for the genus.

2. **BREUTELIA ARUNDINIFOLIA** (Duby) Fleischer. Plate 11, fig. 207.

Breutelia arundinifolia (Duby) FLEISCHER, Laubmfl. Java. 2 (1902–1904) 630.

Hypnum arundinifolium DUBY in Moritzi, System. Verz. (1845–1846) 131.

Very robust plants resembling a small *Lycopodium*, bright yellow above, brown below. Stems up to 15 cm long, sparingly branched, densely felted with tomentum below. Leaves crowded, widely spreading from a short subclasping base; plicate, 6 to 7 mm long, ovate-lanceolate, gradually acuminate; margins recurved near base, plane and denticulate above; costa percurrent, denticulate on back above; upper cells linear, 4 to 5 μ wide and 8 to 12 times as long, sharply papillose on end walls, very long and narrow toward base, brown across line of insertion, about 4 rows at basal angles large, lax, hyaline, forming a conspicuous band extending up margins. Seta terminal, red, erect; capsule horizontal, 4 mm long, furrowed.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13291, Williams 1861;* Mount Tonglon, *Merrill 4903;* Baguio, *Elmer 8609;* Pauai, *Clemens 9315:* Laguna Province, Mount Banahao, *Merrill 7528, Copeland "H.H.," Quisumbing 882:* Pampanga Province, Camp Stotsenburg, *Elmer 22251.* MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11368, 11666.*

Distribution: Sumatra, Java, Celebes, Hawaii.

Damp banks and ledges in the mountains. This fine plant is easily identified by the large, spreading, plicate leaves. The band of lax, hyaline cells at the leaf angles is a conspicuous character.

16. Family SPIRIDENTACEÆ

Very large, fine, lustrous plants growing in dense colonies. Stems up to 40 or 60 cm long, horizontal or pendulous, irregularly and sparingly branched. Leaves scariose, crowded, widely spreading in all directions, gradually narrowed from a clasping base to a long, lanceolate-acuminate, tapering point; margins thickened, spinose serrate; costa excurrent; upper cells rounded, smooth, gradually elongate below and narrowly linear at base. Sporophyte lateral; capsule large on a very short seta; lid conic-rostrate; peristome double, teeth spirally inrolled when dry.

This group comprises the largest of the moss plants and has a wide distribution throughout the islands in Malaysia, Melanesia, and Polynesia.

67. Genus SPIRIDENS Nees

Spiridens NEES in Nov. Act. Leopold.-Carol. pt. 1 11 (1822) 143.

Plants with the characters of the family.

SPIRIDENS REINWARDTI Nees. Plate 14, fig. 208.

Spiridens Reinwardti NEES in Nov. Act. Leopold.-Carol. pt. 1 11 (1822) 143.

Spiridens longifolius LINDB., Oefv. Vet. Akad. Foerh. (1864) 600.

Dioicous; secondary stems from a short rhizomatous base, densely foliate, golden green tinged with brown, flexuose at tips, about 2 cm wide with leaves. Lower leaves small, gradually larger upward, upper leaves abruptly squarrose-spreading from a short, clasping base, up to 12 to 14 mm long, gradually tapering to a slender acuminate point, bordered all around with a thick band of elongated cells; margins erect, distantly spinose-serrate from leaf shoulders to apex; costa excurrent, toothed on back above; basal cells linear, gradually shorter upward, upper cells small, smooth, irregularly hexagonal, with firm pale walls. Sporophyte lateral, shorter than subtending leaves; seta 1 to 3 mm long; capsule glossy, ovoid, curved, about 5 mm long; annulus none; lid conic-rostrate, curved, shorter than urn; peristome teeth inrolled when dry, segments of endostome as long as teeth, cilia none; spores finely papillose, 12 to 14 μ.

Frequent in all the islands and freely fruiting.

Distribution: Java, Timor, Celebes, Borneo, New Guinea.

On tree trunks in moist mountain forests. It seems a pity to encumber this magnificent moss with names that cannot be intelligently applied. In the comparison of the abundant Philippine collections it is utterly impossible to separate the forms with shorter and longer leaf points. They grade insensibly from one extreme to the other, and I fail to see how *S. longifolius* Lindb. can be used, even in a varietal sense, with any degree of satisfaction.

17. Family ERPODIACEÆ

Autoicous; small, delicate, mostly corticolous plants in lax, flat mats. Stems soft, lax in structure, irregularly branched, rather densely foliate. Leaves in 4 or more rows, ovate, concave, ecostate, unbordered; cells parenchymatous, oval-hexagonal, mostly papillose, rarely smooth. Sporophyte at ends of short, lateral branches; seta short; capsule erect; peristome none or simple; calyptra mitriform or campanulate, usually plicate.

68. Genus AULACOPILUM Wils.

Aulacopilum Wils., Lond. Journ. Bot. (1848) 98.

Soft, delicate, pale-green plants in thin flat mats. Stems creeping, irregularly branched. Leaves crowded, ovate, concave, acuminate, symmetrical; cells oval-hexagonal and smooth in our species. Perichætial leaves poorly differentiated; seta very short; capsule exserted, pale, oblong-cylindric; peristome none; calyptra large, plicate, covering entire capsule.

AULACOPILUM LUZONENSE Bartram sp. nov. Plate 13, fig. 209.

Autoicum, pusillum, molle, laxe caespitosum. Caules prostrati, irregulariter ramosi, haud complanati. Folia conferta, ovata, concava, breviter acuminata, integra, ecostata; cellulae magnae, laevissimae, ovali-hexagonae, marginales minores, basilares verus margines in seriebus pluribus transverse elongatae. Seta brevissima, theca exserta, pallida, oblongo-cylindrica; peristomium nullum; calyptra ignota.

Small, soft, delicate plants in thin pale-green mats. Stems creeping, less than 1 cm long, irregularly branched, densely foliate. Leaves appressed when dry, erect-spreading when moist, ovate, short-acuminate, concave, up to 0.8 mm long and 0.4 mm wide, entire, ecostate; cells smooth, oval-hexagonal, thin-walled, 16 to 18 µ wide, 35 to 45 µ long, marginal row smaller and rhomboidal, transversely oval in 5 or 6 rows at basal margins. Seta very short, fleshy, about 0.25 mm long; capsule relatively large, pale, oblong-cylindric, urn 1.2 mm long and 0.5 mm wide, not constricted below mouth, exothecial cells large, lax, thin-walled; peristome none; spores papillose, 35 to 42 μ in diameter. Autoicous.

LUZON, Zambales province, Pamnubuan hills between San Marcelino and Mount Pinatubo, *Bartlett 14163.*

On tree. These plants are richly fruited, but the sporophytes are over-ripe and fail to show the characteristic calyptræ. I am reasonably confident, however, that they belong to *Aulacopilum*, and it seems probable that they are allied to *A. Hodgkinsoniae* (C. M.) of Australia, although widely different in the short-pointed leaves. This is a noteworthy collection, introducing a new family to the Philippine moss flora.

18. Family ORTHOTRICHACEÆ

Medium-sized or robust plants with branched stems usually growing in dense tufts or cushions on trees. Leaves crowded, usually contorted or crispate when dry, oblong or lanceolate; upper cells rounded, often papillose, basal cells elongate, often incrassate. Perichætial leaves scarcely differentiated; seta generally elongate and smooth, rarely short or scabrous; capsules erect, smooth or sulcate especially at mouth; peristome single, double or none; lid with a long, slender beak; calyptra campanulate, naked or pilose; spores variable, frequently large.

Key to the genera of Orthotrichaceæ.

1. Stems erect .... 69. *Orthotrichum.*
   Stems creeping with erect branches .... 2.
2. Capsule immersed .... 72. *Desmotheca.*
   Capsule exserted on an elongate seta .... 3.
3. Calyptra plicate, laciniate at base .... 70. *Macromitrium.*
   Calyptra smooth, lobed at base .... 71. *Schlotheimia.*

69. Genus ORTHOTRICHUM Hedw.

Orthotrichum HEDW., Sp. Musc. (1801) 162.

Medium-sized tufted plants. Stems erect, densely foliate. Leaves hygroscopic, erect when dry, widely spreading when moist, lanceolate or oblong, short-pointed; costa strong, ending near apex; upper cells rounded, incrassate, papillose, elongate and smooth below. Seta short; capsule immersed or slightly exserted, usually ribbed; peristome single or double, teeth in 8 pairs, segments of endostome narrow; calyptra campanulate, usually pilose.

ORTHOTRICHUM MEYENIANUM Hampe. Plate 13, fig. 210.

Orthotrichum Meyenianum HAMPE in C. M. Syn. 2 (1851) 639.

Autoicous; small, densely tufted, pale-green plants. Stems erect, simple or forked. Leaves lingulate from an ovate base, rounded at apex, reflexed when moist; margins revolute nearly to apex; costa ending below apex; cells large, rounded, papillose, incrassate. Capsule shortly exserted, 8-sulcate; peristome double, teeth short, pale, papillose, segments of endostome 8; calyptra sparsely pilose; spores papillose, 20 to 24 µ.

LUZON, Manila, *leg. Meyen*.

Endemic.

I have seen only a few dry fragments of this species between mica sheets and consequently have a very inadequate idea of the plants. The above description is transcribed from the original. The fragments seen surely represent an *Orthotrichum*, but further collections are needed to establish the position of this genus in the local flora.

70. Genus MACROMITRIUM Brid.

Macromitrium BRID., Mant. Musc. (1819) 132.

Mostly dioicous; corticolous plants of variable size. Primary stems creeping, branches usually numerous, erect, forming dense mats or cushions. Leaves crowded, ligulate or lanceolate, acuminate; costa usually percurrent or short-excurrent, rarely ending in an aristate point; upper cells small, rounded, smooth or papillose, basal cells elongate, often tuberculate, with large, rounded papillæ. Seta erect, smooth or scabrous; capsule erect, smooth or plicate at mouth, rarely ribbed to base; peristome variable, seldom wanting; calyptra large, plicate, normally campanulate, naked or pilose, usually deeply laciniate at base; spores variable, papillose.

A large genus, widely distributed throughout tropical regions and difficult to resolve in a systematic way.

Key to the species of Macromitrium.

1. Seta scabrous .... 2.
Seta smooth .... 5.
2. Calyptra naked .... 3.
Calyptra pilose .... 4.
3. Upper leaf cells with narrow, elliptical lumens .... 15. *M. mindorense*.
Upper leaf cells with round lumens .... 7. *M. Blumii*.
4. Small, slender plants, leaves short-pointed .... 1. *M. orthostichum*.
Robust plants, leaves long and slenderly acuminate .... 16. *M. ochraceum*.
5. Calyptra short, leaf base with a broad border of narrow cells.
12. *M. gymnorhynchum*.
Calyptra covering capsule, leaf base not bordered .... 6.
6. Cells of leaf base smooth .... 7.
Cells of leaf base tuberculate .... 17.
7. Seta 10 to 15 mm long, far exceeding branches .... 8.
Seta under 10 mm, scarcely exceeding branches .... 9.

8. Leaves short-acuminate, spirally seriate when dry........ 3. *M. fasciculare.*
   Leaves long acuminate, crispate, scarcely seriate........ 2. *M. Reinwardtii.*
9. Upper leaf cells with narrow lumens, costa long-excurrent.
   14. *M. cuspidatum.*
   Upper leaf cells with round lumens, costa short-excurrent................ 10.
10. Calyptra cucullate, naked .... 8. *M. Robinsonii.*
    Calyptra campanulate, pilose.. 11.
11. Branches short, less than 5 mm long .... 12.
    Branches elongate, more than 1 cm long.. 13.
12. Basal leaf cells linear, seta 7 to 9 mm long............ 4. *M. benguetense.*
    Basal leaf cells short, rounded, seta 5 mm long........ 5. *M. falcatulum.*
13. Peristome none or rudimentary.. 14.
    Peristome of 16 well developed teeth.. 15.
14. Peristome none, leaves gradually acuminate............ 9. *M. Foxworthyi.*
    Peristome a low, papillose membrane, leaves shorter pointed.
    10. *M. subuligerum.*
15. Lamina abruptly rounded at apiculate apex..........11. *M. semipellucidum.*
    Lamina gradually narrowed to acuminate apex.. 16.
16. Costa percurrent, perichaetial leaves acuminate 12. *M. angustifolium.*
    Costa excurrent, perichaetial leaves blunt.................. 13. *M. salakanum.*
17. Capsules furrowed .... 18.
    Capsules smooth .... 19.
18. Capsules deeply sulcate, upper leaf cells smooth.......... 17. *M. sulcatum.*
    Capsules lightly furrowed, upper leaf cells strongly papillose.
    18. *M. goniostomum.*
19. Leaves ending abruptly in an aristate point, calyptra naked.
    7. *M. Blumii.*
    Leaves not aristate-pointed, calyptra pilose.............. 6. *M. nepalense.*

1. MACROMITRIUM ORTHOSTICHUM Nees. Plate 13, fig. 211.

Macromitrium orthostichum NEES in Schwaegr. Suppl. 4 (1842) *pl.* *316a.*

Very slender, densely tufted plants, yellowish above, reddish brown below. Branches erect, rather rigid, with scattered tufts of tomentum below. Leaves small, 1 to 1.4 mm long, not crowded, erect with curved points when dry, erect-spreading when moist, oblong-lanceolate, carinate, abruptly short-acuminate; costa short-excurrent or ending in apex; margins nearly erect, crenulate or bluntly serrulate; cells rounded-hexagonal, 10 to 12 μ in diameter, with thin walls, turgid, minutely papillose, more or less opaque, slightly elongate at extreme base. Seta stout, 3 to 5 mm long, strongly muricate throughout; capsule ovoid, 2 mm long, angulate at mouth; peristome double; calyptra densely pilose with spreading golden yellow hairs.

LUZON, Bontoc Subprovince, Mount Cana, *Ramos & Edaño 38225, 38228;* Tayabas Province, Baler, *Santos 3996.* MINDORO, Puerto Galera, *Bartlett 13560, 13561.* MINDANAO, Sax River, *Williams 3144.* CAMIGUIN DE MINDANAO, *Ramos 14890.*

Distribution: Malay Peninsula, Java, Celebes.

On trees. Easily identified by the very slender branches, rough setæ, and pilose calyptræ.

2. MACROMITRIUM REINWARDTII Schwaegr. Plate 13, fig. 212.

Macromitrium Reinwardtii SCHWAEGR., Suppl. 2 pt. 2 fasc. 1 (1826) 69, *pl. 179*.

Autoicous; small, slender, brownish plants resembling *M. fasciculare*. Leaves crispate when dry, not clearly spirally ranked, more slenderly acuminate, 1.5 to 2 mm long. Seta 12 to 18 mm long, reddish; capsule ovoid, urn 1.5 mm long, tapering to seta, puckered around mouth; peristome single; calyptra naked, deeply laciniate.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1757*; Mount Pulog, *Merrill 6898*, *6400*, *Curran, Merritt & Zschokke 16431*; Pauai, *Merrill 4910*: Bontoc Subprovince, Mount Cana, *Ramos & Edaño 38224*: Ifugao Subprovince, Mount Polis, *McGregor 19893*: Zambales Province, *Ramos 5150*. MINDORO, Mount Halcon, *Merrill 6198*. PANAY, Antique Province, near Flores, Culasi, *McGregor 32633*.

Distribution: Java, Celebes, Borneo, Tahiti, Tasmania.

On branches and twigs of trees. Decidedly more frequent than *M. fasciculare*, and distinguished from the latter by the more crispate, less clearly seriate leaves with longer points, naked calyptræ, and broader capsules. As both species fruit freely, the relatively long setæ may be relied upon as a good field character.

3. MACROMITRIUM FASCICULARE Mitt. Plate 13, fig. 213.

Macromitrium fasciculare MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 51.

Autoicous; slender, golden-brown plants in small tufts. Branches numerous, erect, about 1 cm long. Leaves crowded, spirally seriate around stem with incurved points when dry, spreading and flexuose when moist, 1 to 1.4 mm long, lanceolate, short-acuminate; margins suberect, minutely crenulate above; costa percurrent; upper cells rounded, incrassate, 4 to 6 μ, smooth, gradually elongate below, basal cells linear, smooth, with thick pellucid walls. Seta slender, 1.5 to 2 cm high, smooth; capsule ovoid-cylindric, urn 1.5 mm long, puckered around the narrow mouth; peristome single, composed of 16 papillose teeth, endostome none; calyptra very sparsely ramentose.

LUZON, Laguna Province, Mount Banahao, *Merrill 7590*; Bataan Province, summit of Mount Mariveles, *Merrill 3558*. MINDORO, Mount Halcon, *Merrill 5709*.

Distribution: Ceylon, Java.

On tree trunks and branches. An attractive moss, well marked by the long setæ and the leaves neatly arranged in spiral rows.

3. **MACROMITRIUM BENGUETENSE** Williams. Plate 13, fig. 214.

Macromitrium benguetense WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 343.

Pseudoautoicous; male flowers minute, axillary or on leaves of fertile stems. Small plants in lax mats, dull yellow above, brown below. Branches short, rarely up to 6 mm long. Leaves crowded, erect with strongly circinate points when dry, spreading and incurved when moist, 2 to 3 mm long, linear-lanceolate from an ovate base, acute; margins crenulate above; costa percurrent; upper cells rounded, thin-walled, 8 to 12 μ, mamillose, more elongate below, basal cells linear, incrassate, with narrow lumens, smooth or very slightly tuberculate. Seta smooth, 7 to 9 mm long; capsule ovoid, puckered at the small mouth, urn 1.5 mm long; peristome none; calyptra sparingly pilose with erect hairs above, naked below.

LUZON, Benguet Subprovince, Baguio, *Williams 830*.

Endemic.

On tree. Additional collections are needed to clarify this species.

4. **MACROMITRIUM FALCATULUM** C. M. Plate 15, fig. 215.

Macromitrium falcatulum C. M., Linnæa 38 (1874) 558.

Macromitrium Merrillii BROTH., Ofv. Finsk. Vet.-Soc. Foerh. (14) 47 (1904–1905) 4.

Dioicous; small, dull-green plants in dense, low mats. Branches crowded, very short, erect, not over 5 mm long. Leaves spirally contorted when dry, spreading and incurved when moist, oblong-lanceolate, acute, deeply carinate, 1.5 to 2 mm long; margins minutely crenulate, narrowly reflexed on one side near base; costa percurrent or excurrent in a short apiculus; upper cells rounded-hexagonal, thin-walled, mamillose, basal cells similar but more pellucid and subquadrate, several rows at basal angles on flat side rectangular, hyaline, smooth. Seta 4 to 5 mm long, red, smooth; capsule oblong-ovoid, smooth, urn 1.7 mm long; peristome single, teeth densely papillose; calyptra pilose with erect hairs.

LUZON, ? *Cuming 2212* (type): Cagayan Province, Mount Bawa, *Edaño 80928*; Rizal Province, *Ramos 21843*; Tarlac Province, Concepcion, *Merrill 8520*; Tayabas Province, Kabibihan, *Foxworthy 13149*; Mauban, *Ramos 10396*. PALAWAN, Taytay, *Merrill 8991*. ALABAT, *Merrill 10559*. MINDANAO, Zamboanga Province, Banga, *Whitford & Hutchinson 9035, 9047*.

Distribution: Siam, Borneo.

On trees. *M. Merrillii* Broth. is identical with the type collection of *M. falcatulum* in every particular. The short basal cells are distinctive and have no parallel in any of the local species. On one side of the leaf base the margin is plane, with the marginal cells rectangular and pellucid, while on the other side the margin is reflexed and the marginal cells are unaltered.

6. MACROMITRIUM NEPALENSE (Hook. and Grev.) Schwaegr. Plate 13, fig. 236.

Macromitrium nepalense (Hook. & Grev.) SCHWAEGR., Suppl. 2, pt. 2 fasc. 2 (1827) 134, *pl. 193*.

Orthotrichum nepalense HOOK. and GREV., Brewster Edinb. Journ. 1 (1824) 117, *pl. 4*.

Rather small plants in low, dense tufts, dull yellowish green, brown below. Branches about 1 cm high. Leaves crowded, spirally twisted around stem when dry, 2 to 2.5 mm long, oblong-lanceolate, acute or rounded and apiculate, often cucullate; margins erect, minutely crenulate above; costa percurrent; upper cells minute, rounded, densely papillose, obscure, basal cells incrassate, pellucid, coarsely papillose or tuberculate, linear in several rows at margins, shorter and irregularly oval toward costa, elongate and tinged with brown across insertion. Seta 6 to 10 mm long; capsule cylindric, smooth, urn 2 mm long; peristome single, teeth pale, papillose; calyptra densely pilose with erect hairs.

LUZON, Bontoc Subprovince, Mount Masapilid, *Ramos & Edaño 38241*.

Distribution: Nepal, Sikkim, Siam, Malay Peninsula, China.

On trees. Readily distinguished from its allies by the short-pointed leaves spirally coiled around the stem when dry in conjunction with the pilose calyptræ.

7. MACROMITRIUM BLUMII Nees. Plate 13, fig. 237.

Macromitrium Blumii NEES in Schwaegr. Suppl. 4 (1842) 316b.

Macromitrium Copelandii BROTH., Philip. Journ. Sci. § C 3 (1908) 16.

Macromitrium assimile BROTH., Leafl. Philip. Bot. 6 (1913) 1978.

Rather slender, reddish-brown, densely tufted plants. Branches erect, crowded, densely foliate, sharply pointed. Leaves appressed and spirally twisted around stem when dry, widely spreading when moist, 1.5 mm long, ovate-lanceolate, abruptly contracted to a short, apical arista formed by excurrent costa; margins narrowly reflexed below, erect and minutely crenulate toward apex; upper cells subquadrate, incrassate, smooth, with short, oval lumens, basal cells yellow, linear, with very narrow curved lumens, lightly tuberculate. Seta slender, red, 1 to 1.5 cm long, minutely scabrous above, smooth below; capsule ovoid, smooth, 1.5 mm long; peristome double, short, rudimentary; calyptra naked.

LUZON, Bataan Province, Mount Mariveles, *Copeland "B"*: Zambales Province, *Curran & Merritt 8188*. MINDORO, Mount Halcon, *Merrill 5605*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 89*. MINDANAO, Davao Province, Mount Apo, *Elmer 11668, 11792*.

Distribution: Sumatra, Java, Celebes, Borneo.

On trees, infrequent. The plants described as *M. assimile* Broth. and *M. Copelandii* Broth. certainly lack any specific characters in comparison with *M. Blumii*. I feel confident that they are only minor forms differing in slight and unimportant particulars. The setæ in *M. Blumii* are only slightly scabrous toward apex and in age seem to be essentially smooth. The secondary stems vary considerably in length so that the more robust form with branches up to 2 cm high represent only an extreme. The spiral twisting of the leaves around the stem is nearly constant and, as a result, the tips of the branches are sharply pointed in a characteristic manner.

4. **MACROMITRIUM ROBINSONII** Williams. Plate 13, fig. 216.

Macromitrium Robinsonii WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 344.

Autoicous; medium-sized plants in compact mats, dull yellowish green above, brown below. Branches crowded, erect, 8 to 12 mm long. Leaves erect with circinate points when dry, widely spreading and curved when moist, 1.5 to 2 mm long, oblong-lanceolate from an ovate base, short-acuminate, fragile; margins often narrowly reflexed below, erect and entire above; costa percurrent; upper cells minute, obscure, rounded, papillose, 5 µ in diameter, gradually elongate and pellucid below, basal cells linear with narrow lumens and thick pale walls; seta 6 to 8 mm long, smooth; capsule fusiform, urn 1.5 mm long, narrowed and puckered at mouth, tapering to seta; peristome none; calyptra small, cucullate, naked, 2 mm long.

LUZON, Bataan Province, upper Lamao River, *Williams 1760.*

Endemic.

On trees. Distinguished at once by the cucullate calyptræ, a very unusual character in the genus.

9. **MACROMITRIUM FOXWORTHYI** Broth. Plate 13, fig. 219.

Macromitrium Foxworthyi BROTH., Philip. Journ. Sci. § C 3 (1908) 16.

Dioicous; small, yellowish-green plants in dense tufts. Branches erect, up to 8 mm high. Leaves crowded, erect with strongly circinate points when dry, spreading and incurved when moist, linear-lanceolate, short-acuminate, up to 2 mm long; margins erect, minutely crenulate above; costa percurrent; upper cells minute, dense, papillose, 5 to 7 μ, basal cells narrowly rectangular, smooth, with narrow curved lumens and thick lateral walls. Seta 4 to 5 mm long, smooth; capsule ovoid, smooth, urn 1.5 mm long; peristome none; calyptra densely pilose with erect hairs.

LUZON, Pampanga Province, Mount Abu, *Foxworthy 1033* (type): Bataan Province, upper Lamao River, *Williams 817*: Sorsogon Province, Mount Bulusan, Irosin, *Elmer 16073.* BOHOL, *Ramos 43424.*

Endemic.

On trees. Scarcely distinct from *M. subuligerum* except in the absence of even a rudimentary peristome.

10. **MACROMITRIUM SUBULIGERUM** Bryol. Jav. Plate 13, fig. 220.

Macromitrium subuligerum Bryol. Jav. 1 (1860) 124, *pl.* 102.

Slender, pale-green plants in lax extensive mats. Branches up to 2.5 cm long. Leaves crowded, erect with circinate points when dry, about 2 mm long, narrowly lanceolate, short-acuminate; margins erect, minutely crenulate above; costa ending in or just below apex; upper cells small, dense, papillose, 5 to 6 μ, basal cells elongate, pellucid, incrassate, with narrow, curved lumens. Seta 5 to 8 mm long; capsule ovoid, smooth; peristome a low papillose cylinder, very rudimentary; calyptra pilose.

LUZON, Bataan Province, Mount Mariveles, *Robinson 6213*: Tayabas Province, Mount Pular, *Ramos 19398*; Umiray, *Ramos & Edaño 29085*: Pangasinan Province, Mount San Isidro, *Wenzel 20137*: Laguna Province, San Antonio, *Ramos 14028, 16071.*

MINDORO, Alag River, *Merrill 5683*. PANAY, Iloilo Province, *Robinson 18167*.

Distribution: Java, Celebes, Tahiti.

On trees.

11. MACROMITRIUM SEMIPELLUCIDUM Doz. and Molk. Plate 13, fig. 221.

Macromitrium semipellucidum DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 311.

? *Macromitrium plano-caespitosum* C. M., Linnaea 38 (1874) 560.

Slender plants in rather dense mats. Branches up to 2.5 cm high. Leaves erect with circinate points when dry, up to 1.8 mm long, lanceolate, bluntly pointed and apiculate by excurrent costa; margins minutely crenulate above; upper cells small, dense, opaque, papillose, 5 to 6 µ, basal cells elongate, smooth, incrassate, with narrow curved lumens. Seta 6 to 10 mm long, angled; capsule ovoid; peristome simple, composed of 16 pale-brown, papillose teeth; calyptra pilose.

LUZON, Camarines Norte Province, Paracale, *Alambra 27416*: Laguna Province, San Antonio, *Ramos 20618*; Mount Banahao, *Quisumbing 1780*: Tayabas Province, Baler, *Santos 889a, 840*. PANAY, Capiz Province, Libacao, *Martelino & Edaño 35782*: Iloilo Province, *Robinson 18260*. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens "H," "L," "M," "S"*: Agusan Province, *Weber 1901, 1305, 1316*.

Distribution: Sumatra, Borneo, New Guinea.

On trees. This group, including *M. Foxworthyi*, *M. subuligerum*, *M. semipellucidum*, *M. angustifolium*, and *M. salakanum* is difficult to resolve. The capsules age quickly and it is often difficult to find the peristome in satisfactory condition. Dry specimens of this group are characterized by erect leaves with inrolled points, and under a microscope the elongated pellucid basal cells with narrow, curved lumina change abruptly near midleaf to the dense opaque areolation of the upper blade.

M. plano caespitosum belongs in this group, and, to judge from the scrap I have seen, may be tentatively referred here. The leaves are blunt and the costa excurrent in a short point.

12. MACROMITRIUM ANGUSTIFOLIUM Doz. and Molk. Plate 13, fig. 222.

Macromitrium angustifolium DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1844) 16.

? *Macromitrium Semperi* C. M., Linnaea 38 (1874) 559.

Rather robust, reddish or golden-brown plants in deep tufts. Branches up to 3 cm long. Leaves crowded, erect, with circinate points when dry, about 2.5 mm long, linear lanceolate from an ovate base, gradually and sharply acuminate; costa ending in or just below slender apex; upper cells 5 to 6 μ, lightly papillose, elongate below, with narrow lumens. Perichætial leaves acuminate; seta about 4 mm long; capsule ovoid; peristome single, teeth papillose and fugacious; calyptra pilose above, naked below.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13265*; Pauai, *McGregor 8705*: Bontoc Subprovince, *Vanoverbergh 898*: Camarines Sur Province, Mount Isarog, *Edaño 84235*.

Distribution: Sumatra, Java, Borneo, Celebes.

On trunks and branches of trees. More robust than most of the allies, with longer, slenderly acuminate leaves of the same general pattern.

I have not seen the original material of *M. Semperi*, but there is nothing in the description to indicate a distinct species. It seems to fall here, but may possibly belong with one of the allied group.

11. MACROMITRIUM SALAKANUM C. M. Plate 13, fig. 213.

Macromitrium salakanum C. M., Syn. 2 (1851) 640.

Slender plants, yellowish green above, brown below. Branches up to 3 cm high or higher. Leaves crowded, erect with circinate points when dry, up to 2 mm long, linear-lanceolate from an ovate base, sharply acuminate; costa excurrent in a short apiculus; upper cells minute, papillose, elongate, incrassate, pellucid below with narrow, sigmoid lumens. Inner perichætial leaves bluntly pointed; seta about 4 mm long; capsule ovoid; peristome single, composed of 16 papillose teeth; calyptra sparingly pilose above, naked below.

LUZON, Cagayan Province, Claveria, *McGregor 10739*: Bataan Province, Mount Mariveles, Lamao River, *Whitford 493*: Rizal Province, Mount Lumutan, *Ramos and Edaño 29822*; Mount Susong-Dalaga, *Ramos and Edaño 29452*: Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15101*. CAMIGUIN, Camiguin Volcano, *Edaño 79677*.

Distribution: Java, New Caledonia.

Closely resembling *M. angustifolium* and distinguished principally by the bluntly pointed inner perichætial leaves.

MACROMITRIUM SALAKANUM C. M. var. REFLEXIFOLIUM (Lac.) Fleisch.

Macromitrium salakanum C. M. var. *reflexifolium* (Lac.) FLEISCH., Laubmfl. Java 2 (1902-1904) 447.

Macromitrium reflexifolium LAC., Sp. Nov. Musc. Archip. Ind. (1870) 5.

Macromitrium celebense PAR., Ind. Bryol. ed. 1 (1894-1898) 773.

Secondary stems up to 5 cm long, more rigid. Leaves often squarrose-recurved. Calyptra sparingly pilose all over.

MINDANAO, Sax River, *Williams 3141:* Davao Province, Todaya, Mount Apo, *Williams 2673:* Agusan Province, *Weber 1208, 1314.*

Distribution: Java, Celebes.

A slender form with more elongate, rigid branches that seems to be confined to Mindanao in the local area.

14. MACROMITRIUM CUSPIDATUM Hampe. Plate 14, fig. 244.

Macromitrium cuspidatum HAMPE, Ic. Musc. (1844) *pl. 20.*

Dioicous; robust, glossy, ruddy-brown plants with bright yellow tips. Branches elongate, up to 5 cm long, sparingly rebranched. Leaves crowded, erect with lightly twisted flexuose points when dry, squarrose-spreading or recurved when moist, ovate-lanceolate, long-acuminate, 4 to 4.5 mm long; margins erect, entire; costa excurrent in a long, slightly nodulose arista; upper cells short-rectangular, gradually becoming linear below, smooth throughout with very narrow, curved lumens. Sporophyte quickly becoming lateral by the elongating stems; seta red, smooth, 4 to 5 mm long; peristome single, teeth papillose; calyptra deeply laciniate, sparingly pilose with erect hairs above, naked below.

LUZON, Bataan Province, Lamao River, Mount Mariveles, *Borden 750, Whitford 230* in part, upper Lamao River, *Williams 1822:* Camarines Sur Province, Mount Madooy, *Edaño 84239.* MINDORO, Puerto Galera, *Bartlett 13873* in part. PALAWAN, Mount Pulgar, *Curran 3886;* Mount Manasal, *Edaño 80871* in part.

Distribution: Sumatra, Java, Borneo.

On trees and rocks. One of the finest of the local species and not likely to be confused with any of its allies.

MACROMITRIUM CUSPIDATUM Hampe var. GRACILE Dix.

Macromitrium cuspidatum Hampe var. *gracile* DIX. in herb.

Cum planta typica congruens nisi magnitudine omnium partium multo minore, foliis arctius crispatis, unde ramis multo gracilioribus.

Smaller than the typical plant; branches slender; leaves with strongly crispate points.

PANAY, Antique Province, *McGregor 32652.*

As further collections become available it will be interesting to see if this is a well-marked variety or only a dwarfed form induced by environmental conditions.

15. MACROMITRIUM MINDORENSE Broth. Plate 13, fig. 275.

Macromitrium mindorense BROTH., Philip. Journ. Sci. § C 2 (1907) 340.

Dioicous; laxly tufted, robust, reddish-brown, glossy plants. Branches erect, up to 1.5 cm long. Leaves crowded, erect and flexuose when dry, widely spreading when moist, 4 to 5 mm long, ovate-lanceolate, finely acuminate, carinate-concave; margins erect, minutely denticulate above; costa ending in a pale aristate point; upper cells in straight rows, rhomboidal, incrassate, with narrow elliptic lumens, basal cells narrowly linear, strongly tuberculate, lumens slightly vermicular. Seta 7 to 9 mm long, minutely scabrous throughout; capsule ovoid, smooth, faintly plicate at mouth; peristome not seen; calyptra deeply laciniate, naked.

MINDORO, Mount Halcon, *Merrill 5559, 6165.*

Endemic.

On trees. A robust, ruddy plant distinguished from the other local species with scabrous setæ by the elongated lumens of the upper leaf cells. The peristome is described as simple with short, pale, truncate, papillose teeth, but the capsules in the material available are either too young or too old to show any details.

16. MACROMITRIUM OCHRACEUM (Doz. and Molk.) C. M. Plate 11, fig. 126.

Macromitrium ochraceum (DOZ. & MOLK.) C. M., Bot. Zeit. (1845) 554.

Schlotheimia ochracea DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 314.

Macromitrium mindanaense BROTH., Philip. Journ. Sci. § C 3 (1908) 15.

Robust, golden-brown plants in lax, deep tufts. Branches up to 7 cm long. Leaves crowded, erect with spreading, flexuous points when dry, squarrose-spreading or reflexed when moist, ovate-lanceolate, acuminate, 3 to 4 mm long, strongly carinate; margins reflexed near base, erect and distantly serrulate above; costa excurrent or ending in toothed apex; upper cells rounded, turgid, with firm, pale walls, more elongate and pellucid in point and along upper margins; basal cells linear, incrassate, with very narrow lumens, strongly tuberculate. Seta reddish, angled, densely muricate; capsule ovoid, angulate at deep-red mouth, 2 mm long; peristome double; calyptra densely pilose with long, spreading hairs.

NEGROS, Oriental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 9592*. MINDANAO, Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4794*.

Distribution: Malay Peninsula, Sumatra, Java, Celebes, Borneo.

Apart from the peristome structure, which I have not been able to verify, there are no details of any importance separating *M. mindanaense* from *M. ochraceum*. The capsules are old and worn, so that the description, in this respect, may be at fault. Further information with regard to the local distribution of this fine species will be welcome. The long, ruddy, sparingly branched secondary stems and very rough setæ quickly establish the identity of *M. ochraceum*. It should be looked for in the mountain forests of Luzon.

17. MACROMITRIUM SULCATUM (Hook.) Brid. Plate 14, fig. 127.

Macromitrium sulcatum (Hook.) BRID., Bryol. Univ. 1 (1826) 319.
Schlotheimia sulcata HOOK., Musc. Exot. (1819) *pl. 156*.

Dioicous; robust, glossy, bright reddish-brown plants with golden-yellow tips, densely tufted. Branches up to 5 cm high, tomentose. Leaves crowded, erect, strongly contorted and crispate when dry, erect-spreading when moist, 4 to 5 mm long, lanceolate, long-acuminate, transversely undulate above; margins erect, irregularly denticulate toward apex; costa percurrent; upper cells smooth, rounded, incrassate, 6 to 8 μ, elongate in the point, basal cells narrowly rectangular with narrow lumens and pale, delicate walls, strongly tuberculate, at extreme base near costa a small group of lax, rhomboidal, smooth cells usually well differentiated from adjacent areolation. Perichætial leaves sharply acuminate with more uniformly elongate areolation; seta erect, soon becoming lateral, red, smooth, 10 to 12 mm long; capsule ovoid, small-mouthed, strongly sulcate to base; peristome double; calyptra naked, deeply laciniate.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4984*; Mount Santo Tomas, *Williams 1751*; Pauai, *Merrill 7824*; Mount Tonglon, *Ramos 5506*, *Merrill 7867*; Mount Pulog, *Curran, Merritt, & Zschokke 16424*; Pauai to Baguio, *Merrill 4958*: Zambales Province, Mount Tapolao, *Ramos 5157* in part. MINDANAO, Bukidnon Province, Mount Candoon, *Ramos & Edaño 37184?, 37183.*

Distribution: Eastern India, Ceylon, Malay Peninsula, Borneo.

On trees and boulders. A splendid plant, richly colored and distinct from all the local species in the deeply furrowed capsules. *No. 37184*, from Mindanao, will bear close watching; the leaves end abruptly in fragile, hairlike points, and the sporophyte is not typical. The material is in poor condition and needs to be supplemented by a better collection.

18. MACROMITRIUM GONIOSTOMUM Broth. Plate 14, fig. 228.

Macromitrium goniostomum BROTH., Philip. Journ. Sci. § C 5 (1910) 145.

Dioicous; robust, dull reddish brown plants in lax tufts. Branches up to 3 cm high. Leaves crowded, erect with flexuose or spirally contorted tips when dry, 3 to 3.5 mm long, ovate-lanceolate, acuminate; margins minutely crenulate above; costa percurrent or short-excurrent; upper cells rounded, 10 to 14 μ in diameter, papillose, thin-walled, basal cells linear, incrassate, with narrow, vermicular lumens, strongly tuberculate. Seta 1 to 1.5 cm long, red, smooth; capsule ovoid, lightly sulcate, plicate at dark-red mouth; peristome (as seen) single, teeth short, truncate, pale, coarsely papillose; calyptra sparsely pilose at tip when young, naked when old.

LUZON, Benguet Subprovince, *McGregor 8697*, *Copeland "AB"*; Mount Pulog, *Merrill 6401*; Haight's in the Oaks, *Mearns 4551*. MINDANAO, Davao Province, Mount Apo, *Williams 2662.*

Endemic.

On branches and trunks of trees. Resembling *M. sulcatum* in habit and coloring but quite distinct in the capsules and the larger, thin-walled, papillose leaf cells.

19. MACROMITRIUM GONIORHYNCHUM (Doz. and Molk.) Mitt. Plate 14, fig. 229.

Macromitrium goniorhynchum (Doz. and Molk.) MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 53.

Schlotheimia goniorhyncha DOZ. and MOLK. in Pl. Jungh. 1 (1854) 358.

Dioicous; dull, tawny plants more deeply tinged with brown below, in large dense mats or cushions. Branches crowded, erect, up to 3 cm long, densely tomentose. Leaves crowded, spirally twisted around stem when dry, especially near tips, 2 to 2.5 mm long, oblong-lanceolate, lightly plicate below, gradually long-acuminate, with fragile points, usually broken off near middle; margins entire, erect or narrowly reflexed below; costa ending in or just below apex; cells minute, rounded, smooth, incrassate, extending in a broad band nearly to insertion, often coarsely papillose below on plicæ, with a wide border of linear, pellucid cells quickly narrowed upward and extending along margins more than ⅓ up, marginal row lax, rhomboidal, hyaline. Seta stout, 5 to 7 mm long; capsule large, oblong-cylindric, urn 2.5 to 3 mm long, smooth; peristome double, rudimentary; calyptra short, campanulate, faintly plicate below middle, naked, covering only upper part of urn.

LUZON, Benguet Subprovince, *Mearns 2843a, 2852;* Baguio, *Williams 1753, Merrill 7850, Robinson 14106;* Sablang, *Fenix 12806:* Pangasinan Province, Umingan, *Otanes 18358:* Rizal Province, *Ramos 12550, Reillo 19321;* Bosoboso, *Ramos 988* in part: Bulacan Province, near Norzagaray, *Yoder 56:* Laguna Province, Mount Maquiling, *Bartlett 15769.* PANAY, Iloilo Province, *Robinson 18217.*

Distribution: Khasia, through Malaysia to New Guinea.

On trees and rocks, frequent and often richly fruited. This widely distributed species is easily recognizable by the spirally twisted leaves, large dark-brown capsules, and short calyptræ. Under a microscope the broadly bordered leaf base is very distinctive. It has been segregated with some other closely allied species in the genus *Micromitrium*, but the principal distinguishing character in the short calyptræ seems hardly of generic value.

71. Genus SCHLOTHEIMIA Brid.

Schlotheimia BRID., Mant. Musc. (1819) 114.

Lustrous plants with the habit of *Macromitrium*, usually strongly tinged with brown. Primary stems creeping, branches numerous, crowded, erect, densely foliate. Leaves more or less spirally twisted around stem, oblong-lingulate, mucronate or hairpointed; upper cells rounded, incrassate, smooth, basal cells elongate. Seta erect; capsule cylindric, erect; peristome double; calyptra large, cylindric-campanulate, not plicate, lobed at base and covering entire capsule.

Key to the species of Schlotheimia.

Stem leaves short-mucronate .... 1. *S. Grevilleana.*
Stem leaves with long hairpoints.. 2. *S. Wallisi.*

1. SCHLOTHEIMIA GREVILLEANA Mitt. Plate 14, fig. 230.

Schlotheimia Grevilleana MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 53.

Rather robust, golden-brown, glossy plants in dense tufts or mats. Branches 1.5 to 2 cm long, tomentose. Leaves crowded, erect, slightly spirally contorted when dry, 1.5 to 2 mm long, lingulate, obtuse, mucronate, entire, usually rugulose or transversely undulate in upper half; costa excurrent in a small mucro; upper cells rounded or obliquely oval, 5 to 8 μ, slightly incrassate, smooth, elongate toward base, with narrow pitted lumens. Perichætial leaves 2.5 to 3 mm long, with short acuminate points; seta erect, 4 to 6 mm long, smooth; capsule cylindric, smooth or lightly striate, urn 2.5 to 3 mm long; calyptra glossy, reaching base of capsule, scabrous toward apex, with incurved lobes at base.

LUZON, Benguet Subprovince, Baguio, *Williams 1750, Ramos 5873.*

Distribution: Eastern India, Ceylon, Java, Hongkong, Africa.

On trees. Sharply distinct from *S. Wallisi* in the leaf structure, and at present known only from the vicinity of Baguio.

7. **SCHLOTHEIMIA WALLISI** C. M. Plate 14, fig. 231.

Schlotheimia Wallisi C. M., Linnæa 37 (1872) 173.

Schlotheimia splendida MITT., Trans. Linn. Soc. (1894) 256.

Schlotheimia speciosissima BROTH., Philip. Journ. Sci. § C 3 (1908) 17.

Conspicuously robust, glossy plants in deep, dense tufts, golden brown with a reddish tinge. Secondary stems up to 10 cm long but usually shorter, branched. Leaves crowded, erect and lightly spirally contorted when dry, oblong-lingulate, obtuse, with a long, fine hairpoint, blade 3 to 4 mm long, occasionally rugulose above; margins entire, narrowly recurved below; costa slender, abruptly excurrent in a long, fine flexuose hairpoint; upper cells smooth, rhomboidal, incrassate, more elongate near costa, basal cells linear, sparingly tuberculate on end walls. Perichætial leaves erect, inner gradually acuminate, erose-denticulate at apex, with hairpoints up to 3.5 mm long; seta slender, erect; capsule cylindric, reddish brown; calyptra scabrous above, lobed at base.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merritt, & Zschokke 16397, 16401, 16414, 16415, McGregor 8907;* Mount Ugo, *Ramos 5868;* Laguna Province, Mount Banahao, *Robinson 6600, 19608, Quisumbing 890, Copeland 826;* Zambales Province, Mount Tapulao, *Ramos 5141, Curran & Merritt 8191, 8200.* MINDANAO, Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4708.*

Distribution: Borneo, Celebes.

On trees. An unusually fine plant on account of the large size and the richly colored lustrous foliage. The degree to which the calyptræ are scabrous varies considerably even in the same tuft. It therefore seems obvious that *S. speciosissima* is inseparable from *S. Wallisi*. Dixon has commented on this fact in connection with the Borneo plants.

72. Genus DESMOTHECA Lindb.

Desmotheca LINDB., Journ. Linn. Soc. Bot. 13 (1873) 184.

Synoicous; slender, laxly tufted, rigid plants, dull yellowish green or brown. Primary stem creeping, elongate; sterile branches simple, short; fertile branches longer, rigid, branched near top. Leaves of various forms, appressed with incurved tips when dry, often imbricated in spiral rows, rigidly spreading when moist; costa short-excurrent; cells rounded, papillose, elongate only at extreme base. Sporophyte terminal; capsule immersed on a very short seta; peristome none; calyptra short, campanulate, not plicate, pilose with long, erect hairs.

DESMOTHECA APICULATA (Doz. and Molk.) Lindb. Plate 14, fig. 232.

Desmotheca apiculata (Doz. & Molk.) LINDB., Journ. Linn. Soc. Bot. 13 (1873) 184.

Cryptocarpon apiculatum Doz. & MOLK., Ann. Sci. Nat. 2 (1844) 302.

Sterile branches short, less than 5 mm high; fertile branches rigid, erect, 2 to 3 cm high, sparingly branched near top. Leaves of sterile branches and at base of fertile stems oblong-lanceolate, carinate, entire, 1.4 mm long, incurved when dry; margins recurved below; costa excurrent; upper cells rounded, papillose, elongate at extreme base and basal margins, tuberculate. Leaves of fertile branches, except basal ones, appressed when dry, spirally seriate, rigidly spreading when moist, broadly ovate, less than 1 mm long, basal cells hardly elongate, except toward margins. Capsule terminal, immersed, on a very short seta, erect, ovoid; lid conic-rostrate; peristome none; calyptra small, scarcely reaching below lid, pilose with long, coarse, erect hairs.

LUZON, Cagayan Province, Mannan, *Ramos 7972*: Bataan Province, Lamao River, *Williams 8140*; Olongapo Naval Reservation, *Bartlett 14096*.

Distribution: Sumatra, Java, Amboina, Borneo.

On trees. I have not seen the types of *D. glauca* (C. M.) and *D. coralloides* (Duby), but they are probably identical with *D. apiculata*.

19. Family RHACOPILACEÆ

Small or medium-sized, olive-green or brown plants in dense mats. Stems elongate, prostrate, subpinnately branched, laxly foliate. Leaves dimorphous; lateral rows widely spreading, ovate, cuspidate by excurrent costa; cells rounded, smooth, elongate and laxer toward base; dorsal row (amphigastria) smaller, narrow, erect-appressed. Seta elongate; capsule inclined, furrowed when dry; peristome double, hypnoid in structure; lid beaked; calyptra cucullate, hairy.

73. Genus RHACOPILUM P. Beauv.

Rhacopilum P. BEAUV., Prodr. (1805) 36.

Plants with the characters of the family. Pseudoautoicous; male flowers gemmiform, at the base of minute plants attached to the tomentum or leaves of the fertile stems.

Key to the species of Rhacopilum.

Lateral leaves denticulate, inner basal cells not differentiated.
1. *R. Schmidii.*
Lateral leaves coarsely toothed, inner basal cells lax and wide.
2. *R. spectabile.*

1. RHACOPILUM SCHMIDII (C. M.) Jaeg. Plate 14, fig. 233.

Rhacopilum Schmidii (C. M.) JAEG., Adumbr. 2 (1874–1875) 56.
Hypopterygium Schmidii C. M., Bot. Zeit. (1854) 558.

Rather small, mostly dull yellowish-green plants. Stems creeping, densely radiculose where in contact with substratum, irregularly pinnate. Lateral leaves broadly oblong-ovate, acute, cuspidate by long-excurrent costa, up to 2 mm long and 0.7 mm wide, slightly concave; margins erect, irregularly denticulate above, entire below; costa excurrent in an entire, yellowish arista up to 0.5 mm long; cells rounded-hexagonal, smooth, 8 to 10 μ wide, slightly larger and rectangular at extreme base. Amphigastria smaller, triangular-ovate, long-aristate. Seta yellow, stout, about 12 mm long; capsule inclined, cylindric, deeply furrowed when dry, urn 3 mm long, constricted under mouth; peristome teeth yellow, finely transversely striate on outer face, inner peristome pale, segments widely split, from a high basal membrane, cilia 2 or 3, nodose; lid with a short, blunt, oblique beak; calyptra sparingly pilose with spreading, crispate hairs.

LUZON, Benguet Subprovince, Baguio, *Robinson 14026, Baker 3844, Williams 1772;* Mount Pulog, *Curran, Merritt, & Zschokke 16420;* Bontoc Subprovince, *Vanoverbergh 1008, 1258;* Mount

Masapilid, *Ramos & Edaño 38240*: Rizal Province, Montalban, *Bartlett 14414*: Nueva Ecija Province, Bongabong, *Santos 174, 198*. PALAWAN, Mount Gantung, *Edaño 80895*. PANAY, Iloilo Province, *Robinson 18136*.

Distribution: Nilghiri, Tonkin.

On damp rocks and banks. Very closely allied to *R. cuspidigerum* (Schwaegr.) Mitt. The lateral leaves are possibly slightly broader on the average, but the distinction is very slight. The leaves are denticulate near the apex, not entire as Fleischer notes.[8]

3. **RHACOPILUM SPECTABILE** Reinw. and Hornsch. Plate 14, fig. 234.

Rhacopilum spectabile REINW. & HORNSCH., Nov. Act. Acad. Caes. Leop. 14 (1826) 721, *pl. 40*.

More robust than *R. Schmidti*. Lateral leaves strongly contorted when dry, up to 2.5 mm long, broadly ovate, gradually narrowed to apex, coarsely and distantly toothed in upper half; costa excurrent in a short, stout, cuspidate point; cells rounded, hexagonal, smooth, 10 to 14 μ wide, juxtacostal cells toward base lax, rectangular, up to 45 μ long. Amphigastria smaller, costa long-excurrent. Seta reddish, about 3 cm long; capsule inclined or horizontal, strongly furrowed, 4 to 5 mm long, cylindric; lid with a long, slender, oblique beak; calyptra sparingly pilose.

Common nearly everywhere and usually abundantly fruited.

Distribution: Sumatra, Java, Borneo, New Guinea, New Caledonia, Fiji, Samoa.

On trees, logs, damp rocks and in similar places at all altitudes. An unusually fine species for the genus, well marked by the coarsely toothed leaves and the area of lax cells in the leaf base extending upward along the costa. A collection from Mount Pukis, Bontoc Subprovince, *Ramos & Edaño 38262*, shows the leaves with longer aristate points, but differs in no other way and is hardly worth segregating.

20. Family CRYPHÆACEÆ

Slender, rigid, mostly arboreal plants. Primary stems creeping, secondary stems branched. Leaves closely imbricated, erect and appressed when dry, widely spreading when moist, ovate, acuminate, concave; costa single, strong, ending below apex; cells oval, smooth, incrassate, elongate at base near costa. Sporophyte terminal on branches; capsule ovoid, immersed on a very short seta; peristome single or double; lid short, conic; calyptra small, campanulate, usually scabrous.

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[8] Laubmfl. Java, p. 1626.

Key to the genera of Cryphæaceæ.

Secondary stems short, rigid, ascending leaves entire....... 74. *Acrocryphaea.*
Secondary stems long, pendulous, leaves toothed............. 75. *Pilotrichopsis.*

74. Genus ACROCRYPHAEA Bry. Eur.

Acrocryphaea Bry. Eur. 5 Monog. Cryphaeac. (1851–1855) 2.

Autoicous; secondary stems rigid, julaceous, branched above middle. Leaves concave, appressed, ovate; cells oval, incrassate. Sporophyte terminal on leafy branches of varying length; seta short; capsule immersed; peristome single, of 16 papillose teeth; lid conic; calyptra campanulate, scabrous.

ACROCRYPHAEA CONCAVIFOLIA (Griff.) Bryol. Jav. Plate 14, fig. 236.

Acrocryphaea concavifolia (Griff.) Bryol. Jav. 2 (1864) 106.
Orthotrichum concavifolium Griff., Not. 400; Ic. Pl. Asiat. 2 (1841) *pl. 78, fig. 3.*

Secondary stems ascending, 2 to 4 cm long, rigid, terete when dry, dull yellowish green, loosely tufted, sparingly branched above. Leaves closely appressed when dry, concave, broadly ovate, short acuminate, 1 to 1.5 mm long; margins entire, narrowly inflexed to base of acumen; costa ending in upper third of leaf, often forked above; cells oval, smooth, with thick, pale walls, elongate near costa at base, angular, transversely elongate and in oblique rows toward basal margins. Inner perichætial leaves spathulate, broadly rounded or truncate, aristate by excurrent costa; capsule ovoid, on a very short seta, immersed in perichætial leaves at ends of branches; peristome teeth coarsely papillose; annulus narrow; lid conic, short, calyptra small, papillose, barely covering lid; spores 20 to 25 μ.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 1011*: Benguet Subprovince, Baguio, *Williams 1810*.

Distribution: Nepal, Assam, Ceylon, Java, Celebes.

On trees, infrequent. A slender, wiry plant with nearly imbricated, concave leaves. The capsules are shorter than the perichætial leaves and occur at the ends of short, tumid, leafy branches from the upper part of the secondary stems.

75. Genus PILOTRICHOPSIS Besch.

Pilotrichopsis Besch., Journ. Bot. (1890) 38.

Autoicous; slender, dull golden-brown plants pendent from twigs and branches. Secondary stems often very long, irregularly pinnate, branches short, horizontally spreading, attenuate at tips. Leaves laxly erect when dry, abruptly linear-lanceolate from an ovate, clasping base, toothed above; cells incrassate, with narrowly elliptic lumina, smooth, linear at base near costa, transversely oval in numerous rows toward basal margins. Sporophyte bearing branches very short; capsule immersed in perichætial leaves on a very short seta; peristome double.

PILOTRICHOPSIS DENTATA (Mitt.) Besch. Plate 14, fig. 226.

Pilotrichopsis dentata (Mitt.) BESCH., Journ. Bot. (1899) 38.
Dendropogon dentatus MITT., Trans. Linn. Soc. Bot. 3 (1891) 170.

Pendulous secondary stems up to 10 cm long, often longer, flexuose. Leaves crowded, widely spreading when moist, 2.6 mm long, linear-lanceolate from an ovate, concave base, acuminate; margins sharply and irregularly serrate in upper half, entire and narrowly reflexed below; costa pale brown, ending some distance below apex; upper cells narrow, elliptic, incrassate, 5 to 6 µ wide, 20 to 28 µ long, linear near costa below and transversely oval in about 10 rows toward basal margins. Sporophyte not seen.

LUZON, Cagayan Province, Mount Dos Cuernos, *Ramos 84368*, *84369*, *84376:* Benguet Subprovince, Mount Santo Tomas, *Bartlett 13285*, *13233*, *Hadden 127;* Mount Pulog, *McGregor 8906;* Rizal Province, Susong-Dalaga, *Reillo 19324*. MINDORO, Puerto Galera, *Bartlett 13873* in part. PANAY, Antique Province, Culasi, *McGregor 32618*, *32625*.

Distribution: Japan, Formosa, China.

On trees in mountain forests. The Philippine collections are ample but uniformly sterile. Easily recognized by the leaf outline, sharply toothed margins, and the large area of transversely oval cells at the basal margins which is characteristic of the family.

21. Family CYRTOPODACEÆ

Robust plants; primary stems short; secondary stems elongate, woody, branched above, densely foliate. Leaves subulate-acuminate from a broad base, distantly serrulate above; costa long-excurrent; upper cells bistratose, incrassate, smooth, rounded or elongate, basal cells in one layer, linear toward costa, exterior rows rounded. Seta short; capsule exserted, oblong-cylindric; peristome composed of 16 papillose teeth, endostome none in local species; columella persistent, extending beyond teeth; lid conic-rostrate, spores minute.

76. Genus BESCHERELLEA Duby

Bescherellea DUBY, Bull. Soc. Bot. de France 20 (1873) 130.

Plants with the characters of the family.

BESCHERELLEA PHILIPPINENSIS Broth. Plate 14, fig. 237.

Bescherellea philippinensis BROTH., Philip. Journ. Sci. § C 8 (1913) 74.

Secondary stems laxly tufted, rigid, dull yellowish green, subpinnately branched above middle, up to 10 cm long. Leaves crowded, erect, with slightly spreading setaceous points when dry, widely spreading when moist, 5 mm long, from an ovate base abruptly narrowed to a long linear-setaceous point; margins erect, distantly serrulate above, entire below; costa excurrent in a long, remotely toothed arista; upper cells rounded and narrowly rectangular, incrassate, smooth, in 2 layers, interior cells of leaf base linear, exterior cells rounded or transversely oval in 10 to 12 rows. Perichætial leaves similar but slightly smaller; seta erect or curved, 5 mm long; capsule erect, urn 3 mm long; peristome teeth pale, papillose, closely articulated, endostome none; lid conic-rostrate, 1.2 mm long; spores pale, smooth, 6 to 8 µ.

MINDANAO, Zamboanga Province, Sax River, *Merrill 8354*.

Endemic.

On trees. A mature, operculate capsule in the Bureau of Science specimen shows the sporophyte characters described. The peristome is definitely single and the columella projects conspicuously beyond the teeth after the lid is removed.

22. Family PTYCHOMNIACEÆ

Medium-sized, lustrous plants. Leaves widely spreading, toothed above; costa short and double or none; cells elongate, often pitted. Seta elongate; capsule erect (in the local species), sulcate; peristome double, segments of endostome from a high basal membrane; lid beaked; calyptra cucullate, naked.

Key to the genera of Ptychomniaceæ.

Stems and branches flattened, leaves asymmetrical.............. 77. *Hampeella*.
Stems and branches not flattened, leaves symmetrical.... 78. *Glyptothecium*.

77. Genus HAMPEELLA C. M.

Hampeella C. M., Bot. Centralbl. 17 (1881) 348.

Dioicous; stems elongate, prostrate, with short, erect, flattened branches. Leaves complanate, asymmetrical for the most part, erect-spreading, oblong-lanceolate, acuminate; costa short and double; cells linear, smooth, slightly shorter and laxer at base. Seta elongate; capsule erect, sulcate; peristome double. Sporophyte not seen.

HAMPEELLA LEPTODICTYON Broth. Plate 14, fig. 238.

Hampeella leptodictyon BROTH., Philip. Journ. Sci. § C 8 (1913) 75.

Slender, pale-green, glossy plants. Stems elongate, creeping where in contact with substratum, laxly foliate, subpinnately branched, branches up to 1 cm long, densely foliate, flattened. Branched leaves erect-spreading, complanate, oblong-lanceolate, broadly acuminate, 2 mm long; margins erect, serrulate all around; costa double, short, faint; cells very long and narrow, smooth, with thin, pale walls, 4 to 5 μ wide and 60 to 75 μ long, shorter and laxer across insertion, not differentiated at basal angles.

MINDANAO, Agusan Province, *Weber 1313*.

Endemic.

On twigs and leaves of trees. In habit these plants are markedly different from *H. pallens* (Lac.). The stems are prostrate and pinnate, with short, erect, branches. The branch leaves are more erect and the areolation uniformly narrower, as far as one can judge from a single collection.

78. Genus GLYPTOTHECIUM Hampe

Glyptothecium HAMPE, Linnæa 30 (1859-1860) 637.

Dioicous; rather robust, yellowish-green, laxly tufted plants. Secondary stems elongate, weak, ascending, irregularly branched. Leaves crowded, erect-spreading, ovate-lanceolate, serrulate above; costa double, short; cells narrow, elliptic or rhomboidal, incrassate, more elongate and pitted toward base, exterior rows short-rhomboidal, irregular, very incrassate. Seta short, erect; capsule exserted, ovoid-cylindric, sulcate; peristome double, segments of endostome rudimentary; lid conic-rostrate.

GLYPTOTHECIUM SCIUROIDES (Hook.) Hampe. Plate 14, fig. 239.

Glyptothecium sciuroides (Hook.) HAMPE, Linnæa 30 (1859-1860) 637.
Leskea sciuroides HOOK., Musc. Exot. (1819) *pl. 175*.

Secondary stems lax, up to 9 cm long, with linear-subulate paraphyllia. Leaves spreading on all sides, faintly plicate, broadly ovate-lanceolate, acuminate, up to 3 mm long; margins usually narrowly inflexed on one or both sides, serrulate toward apex; costa short and double; upper cells narrowly rhomboidal or elliptic, with incrassate slightly pitted walls, interior basal cells linear, strongly pitted, exterior cells in 8 to 10 rows at basal margins, short, transversely rhomboidal, very incrassate. Seta 4 to 5 mm long, red; capsule erect, strongly sulcate; peristome teeth pale, pellucid, smooth, basal membrane of endostome about ½ height of teeth, segments none or very fragile and rudimentary.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1854*; Mount Tonglon, *Merrill 7871*.

Distribution: Ceylon, Java, New Guinea, Australia, Tasmania, New Zealand.

On trees. Readily recognized by the erect, deeply furrowed capsules in combination with the nearly nerveless leaves.

23. Family TRACHYPODACEÆ

Dioicous; usually robust plants. Primary stems prostrate, filiform; secondary stems densely foliate, procumbent or pendulous, usually irregularly branched. Leaves acuminate, smooth or plicate; margins toothed; costa single, ending below apex; cells more or less elongate, papillose. Sporophyte lateral; capsule ovoid, smooth, usually erect, exserted on a smooth or papillose seta; peristome double.

Key to the genera of Trachypodaceæ.

1. Secondary stems elongate, remotely branched, very robust, lustrous plants. 80. *Pseudospiridentopsis.*
Secondary stems shorter, subpinnately branched, dull plants . . . 2.
2. Seta smooth, capsule inclined, leaves bordered.................... 82. *Duthiella.*
Seta papillose, capsule erect, leaves unbordered.................................. 3.
3. Leaf cells unipapillate .... 81. *Trachypodopsis.*
Leaf cells seriate-papillose on lateral walls.................. 79. *Trachypus.*

79. Genus TRACHYPUS Reinw. and Hornsch.

Trachypus REINW. & HORNSCH., Nov. Act. Acad. Leop. Carol. 14 pt. 2. Suppl. (1829) 708.

Dioicous; slender or moderately robust, densely tufted plants. Secondary stems crowded, subpinnately branched, laxly procumbent. Leaves lanceolate, acuminate, denticulate; costa short, ending above midleaf; cells narrow, obscure, minutely but densely papillose on lateral walls, smooth and pellucid at base. Seta elongate, papillose; capsule ovoid, erect; peristome double, segments of endostome shorter than teeth, from a low basal membrane; calyptra pilose.

Key to the species of Trachypus.

Very slender plants, branches often flagelliform........................ 1. *T. humilis.*
Robust, coarse plants without flagelliform branches................ 2. *T. bicolor.*

1. TRACHYPUS HUMILIS Lindb. Plate 14, fig. 240.

Trachypus humilis LINDB., Cont. ad Fl. Crypt. As. Bor. Or. (1872) 230.

Slender plants, dull yellowish green above, brown below, in dense, flat mats. Stems up to 3 cm long, prostrate, pinnately branched, branches widely spreading, attenuate at ends, often flagelliform. Stem leaves erect-spreading, plicate, from an ovate base gradually narrowed to a long, linear-lanceolate, grooved point, finely acuminate, up to 1.5 mm long; margins denticulate all around, more or less undulate; costa slender, ending near midleaf; cells narrowly rhomboidal or linear, incrassate, obscure, densely seriate-papillose on lateral walls, laxer, pellucid, smooth near insertion, rounded alar cells few. Branch leaves smaller, less than 1 mm long. Seta slender, reddish, papillose; capsule erect, ovoid, small-mouthed, with a short, indistinct neck; lid long-beaked; calyptra deeply split on one side, pilose with long, erect-spreading hairs; peristome not seen.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1836*; Mount Tonglon, *Merrill 7889* in part.

Distribution: Korea, Japan, Formosa.

On trees. Small, slender, much-branched plants with numerous flagelliform, microphyllous branchlets. The stem leaves are appreciably longer than the branch leaves and usually sharply differentiated.

2. TRACHYPUS BICOLOR Reinw. and Hornsch. Plate 14, fig. 241.

Trachypus bicolor REINW. and HORNSCH., Nov. Act. Leop. Carol. 14 pt. 2 Suppl. (1829) 708.

Robust plants, in dense, feathery mats, dull golden yellow above, strongly tinged with brown or black below. Secondary stems procumbent or pendulous, up to 10 cm long or longer, irregularly pinnate. Leaves crowded, flexuouse, lightly contorted when dry, more spreading when moist, abruptly linear-lanceolate from a short, broad, sheathing base, finely acuminate, lightly plicate, 2 to 4 mm long; margins minutely denticulate, more or less undulate, often inflexed at base; costa slender, ending in upper ⅓ of leaf; cells elongate, incrassate, with narrow pitted lumens, obscure, minutely and closely seriate-papillose along lateral walls, narrowly linear, pellucid and smooth toward base, alar cells shorter, few and poorly differentiated. Seta 1.5 to 2 cm long, densely spinulose throughout; capsule ovoid, glossy, small-mouthed; peristome teeth papillose; segments of endostome short, rudimentary; calyptra densely pilose.

LUZON, Benguet Subprovince, *Santos 32055*, *Merrill 4955*, *6679*; Mount Data, *Merrill 4902*, *Hadden 129*, *Bacani 16013*; Mount Santo Tomas, *Williams 1756*, *Hadden 129a*: Bontoc Subprovince, *Vanoverbergh 1280*; Nueva Vizcaya Province, *McGregor 20222*.

Distribution: Northern India, Ceylon, Siam, Java, Celebes, China, Japan, Formosa, Hawaii.

On tree branches and rotten logs in mountain forests. A very variable species in size and coloration but quite uniform in structural details. The Philippine plants vary toward *T. cuspidatus* Fleisch. in the leaves which have finely attenuated, almost hairlike, points, often hyaline at the tips, but the perichaetial leaves are long and finely acuminate. I feel that it is more practical to group the local forms under *T. bicolor*, in a broad sense. The varietal forms and some of the allied species are too subtle for my understanding.

80. Genus PSEUDOSPIRIDENTOPSIS (Broth.) Fleisch.

Pseudospiridentopsis (Broth.) FLEISCH. Laubmfl. Java 3 (1906) 730.
Trachypodopsis § 2 *Pseudospiridentopsis* BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 832.

Very robust, lustrous plants. Secondary stems long, flexuose, densely foliate, simple or distantly branched. Leaves auriculate, ovate-lanceolate, serrate, horizontally spreading from base, not plicate; costa single, ending near apex; cells narrow, strongly pitted, unipapillate, smooth at base. Seta short, smooth; capsule ovoid, erect; peristome double, hypnoid in structure.

PSEUDOSPIRIDENTOPSIS HORRIDA (Mitt.) Fleisch. Plate 14, fig. 242.

Pseudospiridentopsis horrida (Mitt.) FLEISCH., Laubmfl. Java 3 (1906) 730.
Meteorium horridum MITT. (?)

Secondary stems 12 cm long or longer, golden yellow at tips, tinged with light or dark brown below, mostly simple. Leaves densely crowded, 6 to 7 mm long, horizontally spreading, linear-lanceolate from a short, erect, clasping, cordate-auriculate base, acuminate; margins erect, rather strongly serrate near apex and serrulate below to base; costa slender, ending in leaf point some distance below apex and often forked above; cells very incrassate, with strongly pitted walls, the upper narrowly rhomboidal or oval, unipapillate, 5 to 7 μ wide and 2 to 4 times as long, basal cells linear, smooth, shorter and broader in the auricles. Sporophyte not seen.

LUZON, Benguet Subprovince, Baguio, *Merrill 7959*: Zambales Province, *Curran & Merrill 8195*.

Distribution: Bhotan, Formosa.

On limestone cliffs and probably on trees, rare. A magnificent moss that should command notice in the field by the thick, shaggy, nearly simple stems bristling with closely set leaves on all sides.

81. Genus TRACHYPODOPSIS Fleisch.

Trachypodopsis FLEISCH., Hedwigia 45 (1905) 64.

Robust plants with a rufous tinge, in dense deep masses. Secondary stems irregularly pinnate. Leaves crowded, plicate, serrulate, auriculate at base; costa ending below apex; cells narrowly elliptical, unipapillate over lumens, linear and smooth at base. Seta papillose; capsule erect; peristome double, segments of endostome shorter than teeth, from a low basal membrane; lid short, oblique, conic-rostrate; calyptra cucullate, naked or sparingly pilose.

TRACHYPODOPSIS CRISPATULA (Hook.) Fleischer. Plate 11, fig. 71.

Trachypodopsis crispatula (Hook.) FLEISCH., Hedwigia 45 (1905–1906) 67.

Hypnum crispatulum HOOK., Trans. Linn. Soc. 9 (1816) 321.

Secondary stems ascending or pendulous, up to 10 cm long or longer, laxly pinnate, branches widely spreading. Leaves not crowded, spreading, slightly curved and flexuose when dry, undulate and crispate at tips, more rigid when moist, linear-lanceolate from an ovate, plicate base, acuminate, up to 4 mm long, margins sharply serrulate; costa ending below but near apex; cells narrowly rhomboidal or elliptical, with 1 or 2 small papillæ over lumens gradually more elongate toward margins, basal cells linear, pitted, smooth, small and irregularly rounded in auricles. Branch leaves smaller. Seta short, papillose, 5 to 6 mm long; capsule erect, ovoid.

LUZON, Benguet Subprovince, *Mearns 3396*; Baguio, *Merrill 7826*; Pauai, *McGregor 8690*; Mount Santo Tomas, *Bartlett 13305*: Ifugao Subprovince, Mount Polis, *McGregor 19926*: Abra Province, Mount Posuey, *Ramos 27097*.

Distribution: Himalayas, Yunnan, Ceylon, Andaman Islands. On banks, ledges, and trees in the mountains. I have seen no fertile plants from Luzon, but the plicate, auricled leaves and rufous color are distinctive. *Duthiella complanata* lacks the ruddy color, the leaves are more strongly bordered, the setæ longer and smooth, and the capsules inclined.

62. Genus DUTHIELLA C. M.

Duthiella C. M. Ms. in E. & P. Pflanzenfam. ed. 1 Musci (1908) 1009.

Secondary stems irregularly branched. Leaves linear-lanceolate from an ovate base, not auriculate, points undulate and crispate when dry, narrowly bordered; costa single, ending below apex; cells oval-hexagonal, papillose, obscure, elongate at base, alar group numerous. Seta elongate, smooth; capsule inclined, oblong-cylindric; peristome double, segments of endostome as long as teeth, from a high basal membrane, cilia nodose.

Distinguished from *Trachypodopsis* principally by the elongate, smooth setæ and the inclined capsules.

DUTHIELLA COMPLANATA Broth. Plate 15, fig. 244.

Duthiella complanata BROTH., Philip. Journ. Sci. § C 5 (1910) 157.

Secondary stems laxly ascending, up to 6 cm long, subpinnate or irregularly branched, branches numerous, slightly complanate, densely foliate, yellowish or brownish green. Leaves laxly erect when dry, erect-spreading when moist, linear-lanceolate from ovate, faintly plicate base, acuminate, sharply and strongly serrate, undulate in point, up to 2.7 mm long; costa pale, ending just below apex; cells obscure, oval-hexagonal, angular, with one to several small papillæ over lumina, more elongate and pellucid toward base, marginal row elongate, forming a narrow border all around leaf, alar cells lax, rounded, hyaline. Seta 2 to 2.5 cm long, dark brown, smooth; capsule inclined or horizontal, urn 2 mm long; peristome teeth finely transversely striate on outer face, segments of endostome keeled, widely split, from a high basal membrane, with 2 to 3 intermediate, nodose cilia.

LUZON, Benguet Subprovince, *McGregor 8680, 8706;* Mount Santo Tomas, *Williams 1722, Bartlett 13302* in part.

Endemic.

On rocks and probably on trees. When in fruit the sporophyte characters are distinctive in comparison with *Trachypo-*

dopsis crispatula. Sterile plants may be separated by the leaves which, in *Duthiella*, are not auricled, decidedly more opaque, and more strongly serrate on the margins.

24. Family MYURIACEÆ

Robust, glossy plants, in dense tufts. Secondary stems erect or ascending, densely foliate. Leaves ovate lanceolate, acuminate, ecostate; cells linear, smooth. Sporophyte at ends of short lateral branches; seta slender, elongate; capsule erect; peristome double; calyptra cucullate, naked.

Key to the genera of Myuriaceæ.

Leaves not plicate	83. *Myurium.*
Leaves plicate	84. *Pilotrichum.*

83. Genus MYURIUM Schimp.

Myurium SCHIMP., Syn. (1860) 675.

Dioicous; rather soft, lustrous plants, golden-green above, brown below. Secondary stems densely tufted, suberect, simple or sparingly branched, densely foliate. Leaves erect, concave, ovate or ovate-lanceolate, sharply acuminate; margins erect below, inflexed and serrulate above; cells elongate, smooth, with thin, more or less pitted walls. Seta erect, slender; capsule small, erect, smooth; peristome teeth smooth, pellucid, endostome very rudimentary, without segments.

Key to the species of Myurium.

Leaves abruptly pointed, alar cells numerous, well defined.	1. *M. rufescens.*
Leaves gradually very long-acuminate, alar cells few or none.	2. *M. Foxworthyi.*

1. **MYURIUM RUFESCENS** (Reinw. and Hornsch.) Fleisch. Plate 15, fig. 243.

Myurium rufescens (Reinw. & Hornsch.) FLEISCH., Laubmfl. Java 3 (1906) 672.

Leucodon rufescens REINW. & HORNSCH., Nov. Act. Acad. Caes. Leop. Suppl. 2 14 (1826) 742.

Secondary stems numerous, in dense, soft mats, bright golden-green tinged with brown or red, densely foliate, julaceous. Leaves erect when dry, erect-spreading when moist, deeply concave, 2 to 3.5 mm long, oblong-ovate, abruptly narrowed to a slender, subulate-acuminate, toothed point; margins erect below, broadly inflexed and serrulate above; costa none or very short and double; cells linear, smooth, thin-walled, yellow across insertion, irregularly rounded and angular at basal angles forming a small, well-defined group. Seta slender, smooth, 14 to 20 mm long; capsule ovoid, erect, 1.5 mm long; peristome teeth with numerous apertures along median line, often forked at apex.

LUZON, Albay Province, Mount Mayon, *Robinson 6492*; Cagayan Province, Mount Bababugin, *Edaño 79798*; Cagua, *Edaño 79729, 79755*; Abra Province, Mount Posuey, *Ramos 27029l*. NEGROS, Canlaon Volcano, *Merrill 6804, 6810, 6880*. PALAWAN, Mount Manalsal, *Edaño 80877*.

Distribution: Khasia, Ceylon, Siam, wide in Malaysia, Australia, New Caledonia.

On trees. A widely distributed, variable species. When well developed and colored it is an attractive plant.

2. **MYURIUM FOXWORTHYI** (Broth.) Broth. Plate 13, fig. 248.

Myurium Foxworthyi (Broth.) BROTH., Philip. Journ. Sci. § C 5 (1910) 152.

Oedicladium Foxworthyi BROTH., Philip. Journ. Sci. § C 3 (1908) 23.

Robust, densely tufted, glossy plants, golden-green above, brown below. Secondary stems erect, up to 8 cm high, simple or sparingly branched, occasionally developing elongate, flagellate, microphyllous branches. Leaves crowded, erect-spreading on all sides, 7 to 8 mm long, ovate-lanceolate, concave, gradually long piliform-acuminate; margins inflexed, entire near base, remotely and minutely denticulate above; costa very short and double; cells narrowly linear, smooth, incrassate, porose, laxer near insertion, alar group small, brown, poorly differentiated. Seta slender, red, 1.5 cm long; capsule small, erect, ovoid, 1.5 mm long; peristome teeth entire, smooth, pellucid, endostome not seen; lid obliquely rostrate.

LUZON, Laguna Province, Mount Banahao, *Foxworthy 2429, 2436, Robinson 6698, 9829, Ramos 19608, Copeland 825*. PANAY, Antique Province, near Flores, Culasi, *McGregor 32686*, a form with numerous flagellate branches.

Endemic.

On trees, rare and local. This fine moss seems to have a very limited distribution. It occurs frequently on Mount Banahao but is unknown elsewhere except for the single station in Panay.

84. Genus PILOECIUM C. M.

Piloecium C. M. in sched.; BROTH. in E. & P. Pflanzenfam. ed. 1 Musci (1909) 1124.

Phyllodioicous; robust, pale-brown, glossy plants with a reddish cast. Secondary stems crowded, suberect, simple or sparingly branched, densely foliate. Leaves ovate-lanceolate, deeply plicate; ecostate; cells linear, smooth, porose, alar group conspicuous. Seta slender, erect, minutely pustulose above; capsule small, suberect; peristome double.

PILOECIUM PSEUDORUFESCENS (Hampe) C. M. Plate 15, fig. 267.

Piloecium pseudorufescens (HAMPE) C. M. in E. & P. Pflanzenfam. ed. 1 Musci (1909) 1124.

Hypnum pseudorufescens HAMPE, Nuov. Giorn. Bot. Ital. (1872) 235.

Secondary stems rigid, up to 6 cm long, simple or with a few short branches, coarse, shaggy and blunt at tips. Leaves densely crowded, erect-spreading in all directions when moist, more erect when dry, ovate-lanceolate, acuminate, with numerous deep plicæ extending from base nearly to apex; margins plane, minutely denticulate; cells linear, incrassate, smooth, strongly porose, deep golden brown across insertion, at basal angles large, hexagonal with rounded lumens and thick-colored walls forming a conspicuous alar group. Seta slender, erect, red, up to 1 cm long, smooth below, slightly pustulose toward lightly curved apex; capsule suberect, oblong-ovoid, 1 to 1.2 mm long; peristome teeth finely cross-striate, pale and coarsely papillose at apex, segments of endostome from a high basal membrane; lid oblique, subulate-rostrate; spores papillose, 8 to 10 μ.

MINDANAO, west slope of Mount Hilonghilong, *Weber 1350*; Surigao Province, Agusan Valley, Barrio Guadalupe, *Hutchinson 7562*.

Distribution: Malacca, Sumatra, Borneo, New Guinea, Fiji.

A conspicuous plant with coarse, shaggy, densely leaved stems and deeply plicate leaves.

25. Family PTEROBRYACEÆ

Robust, often frondose plants. Secondary stems woody, usually rigid, densely foliate on all sides, simple or branched. Leaves ovate, acuminate; costa single or double and short; cells elongate, incrassate and porose, usually smooth, alar group often well differentiated. Seta usually short; capsule immersed or exserted, smooth; peristome double, endostome generally rudimentary; lid short-beaked; calyptra small, naked.

Key to the genera of Pterobryaceæ.

1. Primary stems short, rhizomatous, endostome well developed.................. 2.
Primary stems elongate, filiform, endostome rudimentary or none........ 7.
2. Costa excurrent.. 85. *Pterobryella.*
Costa ending in leaf or none.. 3.
3. Frondose plants, leaves flat, smooth.................................. 86. *Trachyloma.*
Secondary stems simple or sparingly branched, leaves concave, plicate or rugose.. 4.
4. Seta papillose, leaves rugose-undulate.............................. 90. *Neolindbergia.*
Seta smooth, leaves plicate.. 5.
5. Perichætial leaves with long aristate points, peristome teeth striolate. 89. *Euptychium.*
Perichætial leaves not aristate, peristome teeth papillose.................. 6.
6. Capsule immersed, calyptra mitriform.............................. 88. *Garovaglia.*
Capsules exserted, calyptra cucullate.............................. 87. *Endotrichella*
7. Secondary stems copiously branched.................................. 8.
Secondary stems mostly simple.. 9.
8. Peristome teeth in 8 pairs.. 93. *Symphysodon.*
Peristome teeth not paired.. 94. *Symphysodontella.*
9. Leaves deeply concave, erect.. 92. *Pterobryopsis.*
Leaves slightly concave, widely spreading.............................. 91. *Jaegerina.*

85. Genus PTEROBRYELLA (C. M.) C. M.

Pterobryella (C. M.) C. M., Bull. Soc. Bot. Fr. (1878) 66.
Hypnum § *Pterobryella* C. M., Linnaea 37 (1872) 182.

Very robust, frondose plants, golden brown with a reddish tinge. Primary stems short, rhizomatous; secondary stems copiously branched in upper half to form a dense frond at top of a rigid, woody, usually naked stipe. Stipe leaves scariose, appressed; branch leaves spreading, ovate, aristate by excurrent costa; cells elongate, smooth. Seta elongate, capsule erect; peristome large, double, teeth finely cross-striate, segments of endostome narrow, as long as teeth, from a high basal membrane, cilia short and rudimentary.

PTEROBRYELLA LONGIFRONS (C. M.) C. M. Plate 15, fig. 148.

Pterobryella longifrons (C. M.) C. M., Bull. Soc. Bot. Fr. (1878) 65.
Pilotrichum longifrons C. M., Bot. Zeit. (1859) 247.

Dioicous; male flowers numerous, axillary, on upper stem and branches. Secondary stems up to 30 cm long, frondose above from a rigid, woody stipe, branchlets pinnate, forming a broad, elongate frond. Stipe leaves early deciduous, appressed, scariose, ovate-lanceolate, acuminate. Frond leaves erect-spreading, rigid, up to 8 mm long, smaller on branchlets, gradually subulate-acuminate from an ovate base; margins erect, serrate near apex, denticulate below; costa strong, brown, excurrent, toothed on back above; cells linear, dense, smooth, rather obscure, more incrassate, brownish and porose near insertion. Perichætium large, inner leaves strongly plicate, gradually narrowed to a long-aristate point formed by excurrent costa; seta slender, smooth, 3.5 to 4 cm long, flexuose; capsule erect, ovoid, urn 3 mm long, wide-mouthed; lid short-rostrate from a convex base.

LUZON, Laguna Province, Mount Banahao, *Robinson 9811, 6592, Curran & Merrill 7985, Foxworthy 2426, Copeland "H.G.," Ocampo 28018, Ramos 1952:* Ifugao Subprovince, Mount Polis, *McGregor 20327:* Bontoc Subprovince, *Ramos & Edaño 38028:* Benguet Subprovince, Mount Pulog, *Ramos & Edaño 40554:* Tayabas Province, Lucban, *Elmer 7777.* MINDORO, Mount Halcon, *Merrill 6183.* MINDANAO, Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4790.*

Distribution: Fiji.

On trees in elevated forests. One of the finest mosses of the local flora, not likely to be confused with anything but *Hypnodendron*, from which it obviously differs in the longer fronds, narrower leaves, and erect, smooth capsules.

86. Genus TRACHYLOMA Brid.

Trachyloma BRID., Bryol. Univ. 2 (1827) 227.

Robust, frondose plants. Primary stems short, rhizomatous; secondary stems woody, bipinnately branched above in a broad frond. Stipe leaves squarrose-spreading; frond leaves ovate, complanate, essentially flat; costa single, short and faint; cells elongate, smooth, porose. Seta elongate; capsule cylindric, suberect; peristome double. Fruit unkown in the Philippines.

TRACHYLOMA INDICUM Mitt. Plate 15, fig. 44.

Trachyloma indicum MITT., Journ. Linn. Soc. Suppl. 2 (Musc. Ind. Or.) (1859) 91.

Trachyloma papillosum BROTH., Philip. Journ. Sci. 31 (1926) 288.

Dioicous; robust, frondose plants growing in loose tufts, yellowish green, glossy. Secondary stems rigid, woody, up to 8 cm high, bipinnate above in a rather lax frond, often with clusters of brown, filiform propagula at tips of branches. Stipe leaves squarrose-spreading and recurved, gradually larger upward; frond leaves widely spreading, complanate, asymmetrical, broadly ovate, acuminate, up to 4 mm long; margins plane, serrulate above; costa single or forked, faint, ending below midleaf; cells linear-rhomboidal, 8 μ wide, 80 to 90 μ long, smooth, laxer and more porose near insertion; branch leaves similar but smaller. Sporophyte not seen.

LUZON, Cagayan Province, Dos Cuernos, *Ramos 84370:* Benguet Subprovince, Mount Santo Tomas, *Hadden 180;* Baguio, *Williams 1788, Elmer 8541;* Mount Pulog, *Curran, Merritt, & Zschokke 16427?* NEGROS, Oriental Negros Province, Dumaguete, *Chapman 43.* MINDANAO, Bukidnon Province, Tangculan, *Ramos & Edaño 87174* in part.

Distribution: Ceylon, Sumatra, Java, Ceram, Lombok, Celebes, Borneo, Annam, New Guinea.

On trees. The Mount Pulog specimen consists of a few plants in poor condition and is labelled *T. tahitense* Besch., but differs slightly if at all from the others. The distinction between *T. indicum* and *T. tahitense* is slight, and I doubt whether they can be satisfactorily separated. The leaf cells of *T. papillosum* Broth. are not papillose. Granular spots in the cytoplasm give the appearance of papillæ, but the cells are smooth in profile and in cross section.

87. Genus ENDOTRICHELLA C. M.

Endotrichella C. M., Linnæa 37 (1871–1873) 156.

Dioicous; robust, rigid, glossy plants. Primary stems short, rhizomatous; secondary stems woody, mostly laxly foliate, more or less flattened, simple or sparingly branched. Leaves ovate-lanceolate, plicate, toothed; costa short and double; cells elongate, smooth. Perichætium small, leaves acuminate; seta short; capsule exserted; peristome double, teeth papillose, segments of endostome filiform from a low basal membrane; calyptra cucullate, naked.

Key to the species of Endotrichiella.

1. Leaves crowded, erect-spreading, margins denticulate above. 1. *E. Elmeri.*
Leaves not crowded, widely spreading, margins serrate above .... 2.
2. Leaves ending in a long, fine hairpoint .... 3. *E. pilifera.*
Leaves subulate-acuminate, not hairpointed .... 3.
3. Leaves broad, ovate-lanceolate .... 2. E. *elegans.*
Leaves narrowly lanceolate, very long-acuminate .... 4.
4. Leaves lightly plicate, acumen spinose-serrate .... 4. *E. serricuspes.*
Leaves strongly plicate, acumen serrate .... 5. *E. perplicata.*

1. ENDOTRICHELLA ELMERI Broth. Plate 15, fig. 250.

Endotrichella Elmeri BROTH., Leafl. Philip. Bot. 6 (1913) 1977.

Secondary stems rigid, up to 5 cm long, simple, densely foliate, golden green at tips, reddish brown below, 1 cm wide

6. **ENDOTRICHELLA PERPLICATA** Broth. Plate 15, fig. 254.

Endotrichella perplicata BROTH., Philip. Journ. Sci. § C 8 (1913) 77.

Lustrous, golden-brown plants with the habit of *E. elegans*. Secondary stems laxly tufted, up to 10 cm long. Leaves 6 to 7 mm long and about 1 mm wide, narrowly ovate-lanceolate, deeply plicate, sometimes slightly undulate, gradually narrowed to a long, subulate-acuminate, serrate point. Sporophyte as in *E. elegans*.

LUZON, Rizal Province, San Isidro, *Ramos 12126* (type); San Andales, *Reillo 19918*: Ifugao Subprovince, Mount Polis, *McGregor 20324*; Cagayan Province, Mount Babatugin, *Edaño 79795*, *79805b*.

Distribution: Borneo.

On trees. This species seems to differ consistently from *E. elegans* in the narrower leaves with longer, more slenderly acuminate points. It is uncomfortably close to *E. serricuspes*, but I fail to find any leaves with acumens showing the spinelike teeth of that species. With a larger series of specimens it may become obligatory to unite these two forms in one specific concept.

88. Genus GAROVAGLIA Endl.

Garovaglia ENDL., Gen. Pl. (1836) 57.

Pseudautoicous; male plants minute, on leaves of fertile stems. Robust, rigid plants. Primary stems short, rhizomatous; secondary stems elongate, simple or sparingly branched, densely foliate and somewhat flattened. Leaves erect-spreading, ovate, ecostate, plicate and often undulate; margins toothed; cells incrassate, porose, yellow across insertion. Perichætium large; leaves broad, rounded or truncate and apiculate at apex; capsule ovoid-cylindric, immersed on a very short seta; peristome teeth more or less split along median line, papillose, segments of endostome filiform, nodose, from a very low basal membrane; calyptra small, mitriform.

Key to the species of Garovaglia.

1. Leaves strongly transversely undulate .... 1. *G. punctidens*.
Leaves not transversely undulate .... 2.
2. Robust plants, stems up to 8 cm long and 3 mm wide .... 2. *G. plicata*.
Slender plants, stems under 6 cm long and 2 to 3 mm wide.
3. *G. luzonensis*.

1. **GAROVAGLIA PUNCTIDENS** Williams. Plate 15, fig. 255.

Garovaglia punctidens WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 352.

Garovaglia Bakeri BROTH., Philip. Journ. Sci. § C 13 (1918) 209.

Garovaglia perundulata BROTH., Philip. Journ. Sci. § C 13 (1918) 210.

Secondary stems rather slender, erect, flexuose, up to 8 cm long, densely foliate, slightly flattened, pale green or yellowish, glossy. Leaves erect-spreading, up to 4 mm long and 2 mm wide, broadly ovate-lanceolate, acuminate-plicate and deeply transversely undulate; margins spinose-serrate near apex, serrate about halfway down; cells incrassate, porose, narrowly elliptical above, linear toward base, golden brown across insertion, shorter and broader at basal angles in a well-defined alar group. Perichætial leaves very broad, truncate and apiculate at apex; seta less than 1 mm long; capsule oblong, urn 1.5 to 2 mm long; peristome teeth nearly smooth, irregularly divided.

LUZON, Benguet Subprovince, Baguio, *Williams 3151* (type): Bontoc Subprovince, Bauco, *Vanoverbergh 3952*; Mount Cana, *Ramos & Edaño 38226*: Ifugao Subprovince, Mount Polis, *McGregor 19917*: Laguna Province, Mount Banahao, *Baker 2924*.

Endemic.

On trees. A relatively slender plant with lightly flattened to almost terete stems and strongly undulate leaves. *G. Bakeri* is identical in every way both in the description and in the plant itself. Although *G. perundulata* is described as having thin-walled leaf cells I find them actually incrassate and in no way different from those of the other collections included here.

2. **GAROVAGLIA PLICATA** (Nees) Endl. Plate 15, fig. 256.

Garovaglia plicata (Nees) ENDL., Gen. Pl. (590) (1836–1850) 52.

Secondary stems robust, golden green at ends, brown below, up to 8 cm long, erect or arched, flattened, usually simple, 6 to 8 mm wide with leaves. Leaves up to 6 mm long, 2.5 mm wide, broadly ovate-lanceolate, acuminate, deeply plicate, not or scarcely undulate, sharply serrate toward apex; cells narrow, elliptical, with firm, porose walls, linear toward base, colored across insertion and well differentiated at basal angles. Perichætial leaves numerous; capsule immersed; seta very short; peristome teeth more or less divided, papillose.

LUZON, Bontoc Subprovince, *Vanoverbergh 522*: Benguet Subprovince, Mount Santo Tomas, *Clemens 51924*. NEGROS, Oriental

Negros Province, Dumaguete, *Chapman 88*. MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 2674;* Lanao Province, Lake Lanao, Camp Keithley, *Clemens "F."*

Distribution: Sikkim, Sumatra, Java, Celebes, Ceram.

On trees. Var. *gracilescens* is a well-marked form, especially in the narrower, divaricately arched, lateral leaves.

GAROVAGLIA PLICATA (Nees) Endl. var. GRACILESCENS Broth.

Garovaglia plicata (Nees) ENDL. var. *gracilescens* BROTH., Philip. Journ. Sci. § C 13 (1918) 210.

Stems slenderer and elongate, up to 11 cm long, laxly foliate. Lateral leaves widely spreading.

LUZON, Nueva Vizcaya Province, *McGregor 20224*.

4. GAROVAGLIA LUZONENSIS Williams. Plate 15, fig. 217.

Garovaglia luzonensis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 353.

Secondary stems erect or curved, 3 to 6 cm long, golden brown above, paler below, densely leaved and terete, not at all flattened, 2 to 3 mm wide with leaves. Leaves erect-spreading, with inflexed points when dry, more rigidly spreading when moist, up to 3 mm long and 1.5 mm wide, oblong-ovate, abruptly short-acuminate, plicate but not undulate, serrate near apex, serrulate below halfway down; cells narrowly elliptical, incrassate, porose, linear toward base, short and broad at basal angles forming a distinct hyaline or yellowish alar group. Seta very short; capsule exceeded by perichætium, ovoid, urn 1.5 mm long; peristome teeth faintly papillose, irregularly divided; lid short, apiculate; spores papillose, 25 to 30 μ.

LUZON, Benguet Subprovince, Baguio, *Williams 1878*.

Endemic.

On trees. An unusually small plant for the genus. Well marked by the short, rigid, terete stems.

89. Genus EUPTYCHIUM Schimp.

Euptychium SCHIMP., Nov. Act. Acad. Leop.-Carol. 32 (1865).

Dioicous; robust, glossy, golden-brown plants resembling *Garovaglia*. Secondary stems elongate, densely foliate. Leaves ecostate, broadly ovate, plicate; cells elongate, porose. Perichætial leaves ending in long-aristate points; capsule immersed; peristome double, teeth finely cross-striate, segments of endostome broad, keeled, from a high basal membrane; calyptra short, mitriform, naked.

EUPTYCHIUM PHILIPPINENSE Dix., sp. nov. Plate 16, fig. 231.

Robusta nitida, lutescenti-viridis. Caules secundarii numerosi, arcuati, ad 10 cm longi, densissime foliosi, cum foliis ad 1 cm lati. Folia erecto-patentia, plicata, ecostata, ovato-lanceolata, raptim acuminata, acumen semitortum, superne minute denticulata; cellulae lineares, magis incrassatae, porosae, alares ovales, lutescentes, numerosæ. Folia perichaetialia longissime aristato-acuminata; theca immersa, exostomii dentes carnosi, aurantiaci, transverse striolati, processus lati, carinati; spori papillosi, magni.

Robust, glossy yellowish-green plants tinged with brown. Secondary stems up to 10 cm long, simple, naked at base, densely foliate above, 1 cm wide with leaves. Leaves broadly ovate-lanceolate, plicate, 5 to 6 mm long, 2 mm wide, acuminate, acumen short, often twisted; margins minutely denticulate above, entire below; upper cells very incrassate, porose, with linear lumens, 4 µ wide and 50 to 70 µ long, golden brown across insertion, rounded, thick walled and colored at basal angles forming a small, distinct alar group. Perichætial leaves toothed at apex, ending in a long, minutely denticulate arista; capsule immersed, urn 2.5 mm long; peristome large, fleshy, furrowed along median line, strongly trabeculate on inner face, transversely striolate on outer surface, segments of endostome broad, keeled, as long as teeth, from a high basal membrane; lid conic-rostrate, erect; calyptra mitriform, smooth or minutely scabrous near tip; spores large, ovoid, papillose, irregular in size, up to 60 µ long.

PALAWAN, Mount Manassal, summit, altitude 4,000 feet, *Edaño 80800*.

Endemic.

This is a noteworthy addition to the Philippine flora. The genus has a very local distribution centering around New Caledonia and extending only to Fiji and the New Hebrides. Our species closely resembles *E. setigerum* (Sull.) from which it differs in the more finely acuminate leaves and the longer, more strongly porose leaf cells.

90. Genus NEOLINDBERGIA Fleisch.

Neolindbergia FLEISCH., Laubmfl. Java 3 (1906) 726.

Secondary stems coarse, rigid, sparingly branched, dull yellowish green. Leaves crowded, conspicuously rugose; costa percurrent; cells rounded, incrassate, elongate toward base.

Capsule ovoid, erect, on a short, papillose seta; peristome single, teeth short and smooth; calyptra pilose.

NEOLINDBERGIA RUGOSA (Mont.) Fleisch. Plate 13, fig. 254.

Neolindbergia rugosa (Mont.) FLEISCH., Laubmfl. Java 3 (1906) 727.
Dicnemon rugosus MONT., Hooker, Lond. Journ. Bot. (1845) 10.

Secondary stems robust, up to 6 cm long. Leaves appressed when dry, rigidly spreading when moist, irregularly and deeply undulate and rugose, ovate-lanceolate, concave, 2 to 2.5 mm long; margins erect, minutely denticulate near apex, entire below; costa slender, percurrent or very short-excurrent; cells smooth, with thick, pale walls, oval and more or less angular above, 6 to 8 µ, linear and strongly pitted in interior of leaf base, shorter, rectangular, and rounded in numerous rows toward basal margins, golden brown across insertion. Seta erect, papillose, 4 to 5 mm long; capsule exserted, ovoid-cylindric, erect, urn 2 mm long, smooth; peristome, as seen, single, inserted below rim, teeth broad, thin, short, irregularly truncate, hyaline or pale yellow, smooth, extending about 85 µ beyond rim; calyptra pilose with strict, erect hairs; spores papillose, 10 to 12 µ.

LUZON, Tayabas Province, Baler, *Santos 256*: Nueva Ecija Province, Bongabong, *Santos 202*. MINDANAO, Zamboanga Province, Sax River, *Williams 2397*, *Merrill 8361*: Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13530*.

Distribution: Celebes, Borneo.

On trees. Pock-marked leaves are the insignia of this curious species. All the capsules I have seen are overripe, with the peristome worn and eroded. The genus is a small one, confined to Malaysia, but until the peristome structure is definitely determined its systematic position is uncertain. It seems to have little in common with the Prionodontaceæ and I am inclined to feel that it fits more comfortably in Pterobryadeæ with regard to both the gametophyte and the sporophyte characters.

91. Genus JAEGERINA C. M.

Jaegerina C. M., Linnæa 40 (1876) 274.

Dioicous; robust or medium-sized plants. Secondary stems suberect, usually simple, rather densely foliate. Leaves widely spreading, ovate-lanceolate, acuminate, slightly concave, smooth or lightly plicate, denticulate above; costa single, ending near apex; cells elongate, poorly differentiated at basal angles. Perichaetial leaves small; seta short, erect; capsule exserted, ovoid, smooth, erect; peristome double, teeth short, pale and hyaline, more or less paired, endostome very rudimentary; calyptra small, naked or sparsely pilose.

Key to the species of Jaegerina.

Robust plants, stems 6 to 10 cm long, leaves plicate........ 1. *J. luzonensis.*
Small plants, stems 1 to 2.5 cm long, leaves not plicate.... 2. *J. Williamsii.*

1. **JAEGERINA LUZONENSIS** Broth. Plate 15, fig. 260.

Jaegerina luzonensis BROTH., Philip. Journ. Sci. § C 8 (1913) 70.

Secondary stems elongate, wiry, flexuose, up to 10 cm long, simple or forked above, in lax, dull yellowish-green tufts. Leaves eroded and worn below, crowded above, divaricately spreading on all sides from a short clasping base, lightly plicate especially when dry, ovate-lanceolate, broadly acuminate, 4 mm long; margins erect, minutely denticulate all around; costa single, pale brown, ending near base of acumen; cells linear with rounded ends, 4 to 5 µ wide, 30 to 34 µ long, incrassate, porose, smooth or minutely papillose on back near apex, shorter, laxer and golden brown across insertion, alar cells not differentiated. Sporophyte unknown.

LUZON, Benguet Subprovince, Baguio, *Merrill 7873*: Rizal Province, Montalban, *Bartlett 14585*.

Endemic.

On limestone cliffs. A robust, shaggy plant with a superficial resemblance to *Aerobryopsis*, but readily separated by more broadly pointed leaves widely spreading in all directions and the nearly smooth different-shaped leaf cells.

2. **JAEGERINA WILLIAMSII** Bartram nom. nov. Plate 16, fig. 262.

Jaegerinopsis luzonensis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 364.

Secondary stems short, scattered, mostly simple, erect, curved, up to 2.5 cm long, densely foliate nearly to base. Leaves widely spreading on all sides, ovate-lanceolate from a cordate base, gradually narrowed to a short, broad, acuminate point, 1.5 to 2 mm long, lightly striate when dry; margins minutely denticulate all around; costa pale, slender, ending near base of acumen; cells linear with rounded ends, slightly incrassate, porose, 3 to 4 µ wide, 20 to 30 µ long, minutely papillose on back above, yellow across insertion, differentiated alar cells few or none. Perichætial leaves long-acuminate, up to 3 mm long; seta erect, 2.5 to 3 mm long; capsule exserted, erect, oblong-ovoid, urn 1 to 1.5 mm long; peristome teeth short, pale, smooth.

LUZON, Bataan Province, upper Lamao River, *Williams 835*.

Endemic.

On trees. A distinct species with regard to size and other particulars, but scarcely separable from *Jaegerina* by any distinctions of generic import. As *Jaegerina luzonensis* is in use I take pleasure in renaming this species in honor of my good friend Mr. Williams.

92. Genus PTEROBRYOPSIS Fleisch.

Pterobryopsis FLEISCH., Hedwigia 45 (1905) 56.

Fairly robust, laxly tufted, glossy plants. Secondary stems woody, sparingly branched, flexuose, densely foliate, tumid. Leaves deeply concave, abruptly contracted to a long, subulate point; costa single or none; cells elongate, smooth, well differentiated at basal angles. Capsule immersed; peristome teeth short, pale, smooth.

Key to the species of Pterobryopsis.

Costa single, to midleaf.. 1. *P. crassicaulis*.
Costa none.. 2. *P. gedehensis*.

1. PTEROBRYOPSIS CRASSICAULIS (C. M.) Fleisch. Plate 16, fig. 264.

Pterobryopsis crassicaulis (C. M.) FLEISCH., Hedwigia 45 (1905) 57.
Neckera crassicaulis C. M., Syn. 2 (1851) 132.

Secondary stems erect, flexuose, up to 6 cm long, simple or more rarely forked, densely foliate from near base, pale yellowish green above, brown below, glossy, tumid, 6 to 8 mm wide with leaves, often prolonged in a slender, terminal, microphyllous shoot. Leaves erect-spreading, oblong-ovate, deeply concave, cucullate, smooth, 4 mm long, abruptly contracted to a long linear-subulate point; margins broadly inflexed and minutely denticulate above, erect and entire below; costa single, ending above midleaf; cells linear, incrassate, porose, smooth, golden brown across insertion, oval-hexagonal, very incrassate and deeply colored at basal angles forming a conspicuous alar group. Perichætial leaves ovate-lanceolate, up to 6.5 mm long, gradually narrowed to a long-aristate point; capsule immersed on a very short seta, oblong-cylindric, urn 2 mm long, exothecial cells hexagonal, thin walled; peristome teeth pale yellow, pellucid, 225 µ long, smooth, inserted below rim, endostome none or very rudimentary; lid conic, short, 0.4 mm long; calyptra sparingly ramentose with a few linear, erect scales.

LUZON, Bataan Province, upper Lamao River, *Williams 836*. NEGROS, Oriental Negros Province, *Elmer 9453* in part. PANAY, Capiz Province, Mount Bulilao, *Martelino & Edaño 35815* in part.

Distribution: Ceylon, Sumatra, Java.

On trees. This and the following species are well characterized by the tumid stems bristling on all sides with the slender, rigid leaf points. The smooth, deeply concave, cucullate leaves are quite distinct from those of any of the local allied genera, with nearly simple secondary stems. The sporophyte characters have not been described before to my knowledge.

2. **PLEUROBRYOPSIS GEDEHENSIS** Fleisch. Plate 16, fig. 263.

Pleurobryopsis gedehensis FLEISCH., Hedwigia 45 (1905) 67.

Closely resembling *P. crassicaulis* in habit and appearance, but sharply distinct through the smaller, ecostate leaves. The secondary stems are not quite as robust, and more stipitate at the base with the stipe leaves small, scalelike and closely appressed.

MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *M. S. Clemens "E," "P"*; Pugaan Hill, *Bartlett 15026a*.

Distribution: Java.

The Mindanao plants are thoroughly typical and surely belong to this species.

93. Genus SYMPHYSODON Doz. and Molk.

Symphysodon DOZ. & MOLK., Ann. Sci. Nat. (1844) 314.

Rather robust plants. Secondary stems rigid, branched above in a frondose head terminating a woody stipe. Stipe leaves scalelike, appressed. Frond leaves ovate-lanceolate, acuminate, deeply concave, coarsely serrate toward apex; costa single ending near base of acumen; cells elongate, smooth, poorly differentiated at basal angles. Capsule immersed; peristome teeth paired, smooth, deeply inserted; calyptra small, conical, sparingly piloze.

Key to the species Symphysodon.

Secondary stems 2 to 3 cm high, branches seldom attenuate.
1. *S. neckeroides*.
Secondary stems about 6 cm high, branches often attenuate.
2. *S. subneckeroides*.

1. **SYMPHYSODON NECKEROIDES** Doz. and Molk. Plate 16, fig. 264.

Symphysodon neckeroides DOZ. & MOLK., Ann. Sci. Nat. (1844) 314.

Secondary stems erect, up to 3 cm high, frondose from a slender, woody stipe, brownish green, glossy, branches short, flattened, densely foliate, usually blunt. Leaves erect-spreading, striate especially when dry, oblong-lanceolate, deeply concave, short-acuminate, 2.5 to 3 mm long; margins narrowly recurved below, erect and coarsely serrate toward apex; costa single, ending near base of acumen; cells linear, smooth, with pale, thin walls, laxer, porose, and golden brown across insertion. Capsule immersed on a very short seta; peristome teeth in 8 pairs, smooth; calyptra with a few erect hairs.

PANAY, Iloilo Province, Ulian River, *Robinson 18258*.

Distribution: Sumatra, Java, Borneo, New Caledonia.

On trees. A trim little frondose plant well marked by the deeply concave, single-nerved leaves.

2. SYMPHYSODON SUBNECKEROIDES Broth. Plate 16, fig. 265.

Symphysodon subneckeroides BROTH., Leafl. Philip. Bot. 2 (1909) 655.

Resembling *S. neckeroides* but consistently more robust. Secondary stems 4 to 6 cm long, branches often attenuate at tips, strongly complanate. Leaves oblong-ovate, deeply concave, rather abruptly narrowed to a long half-twisted, coarsely serrate acumen; costa single, ending near base of acumen; cells and sporophyte characters as in *S. neckeroides*. Spores large, up to 65 μ.

LUZON, Cagayan Province, Mount Babatugin, *Edaño 79800*, *79812*. NEGROS, Oriental Negros Province, Cuernos Mountains, *Elmer 9453* (type); Dumaguete, *Chapman 8*. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *M. S. Clemens "Q"*; Palao Amopo, *Bartlett 16065a*.

Endemic.

The attenuate branch tips are not always present, but in other respects the species seems to be fairly distinct from *S. neckeroides*. Probably the most uniform difference is in the frond leaves, which are more abruptly contracted to a longer, linear-acuminate point which is often twisted in a half turn.

94. Genus SYMPHYSODONTELLA Fleisch.

Symphysodontella FLEISCH., Laubmfl. Java 3 (1906) 688.

Pale-green lustrous plants. Secondary stems suberect, flexuose, slender, irregularly pinnate or bipinnately branched above from a woody stipe, often with long, flagelliform, microphyllous branches. Leaves ovate-lanceolate, acuminate, concave, smooth; costa short, single or double; cells elongate, smooth, not differentiated at basal angles. Capsule immersed or shortly exserted; peristome teeth lanceolate, smooth, pellucid, equidistant, endostome very rudimentary or none; calyptra small, cucullate, naked; spores large.

Differs from *Symphysodon* in the slender, laxly pinnate habit, evenly spaced peristome teeth, and naked, cucullate calyptra.

Key to the species of Symphysodontella.

1. Capsule exserted, seta 2 mm long.............................. 2. *S. attenuatula.*
   Capsule immersed, seta less than 1 mm long .... 2.
2. Leaves short-pointed, costa usually short and double.... 3. *S. cylindracea.*
   Leaves long-acuminate, costa single to above midleaf........ 1. *S. subulata.*

1. **SYMPHYSODONTELLA SUBULATA** Broth. Plate 16, fig. 265.

Symphysodontella subulata BROTH., Leafl. Philip. Bot. 2 (1909) 654.
Symphysodontella Elmeri BROTH., Leafl. Philip. Bot. 6 (1913) 1977.

Secondary stems slender, irregularly pinnate from a short, stipelike base, branches spreading, attenuate, laxly foliate, often flagelliform and microphyllous, up to 10 cm long. Leaves erect-spreading, up to 2 mm long, oblong lanceolate, contracted to a long, linear-subulate denticulate point; margins erect, inflexed above, denticulate toward apex; costa slender but distinct, ending near base of acumen; cells narrowly linear, smooth, with firm, pale walls, short, porose, and golden brown across insertion. Perichætial leaves erect, long filiform-acuminate; capsule immersed, oblong; peristome teeth pale yellow, pellucid, smooth, with a median furrow, deeply inserted; spores papillose, up to 40 to 45 µ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1684, 1685;* Bontoc Subprovince, Malawey, *Vanoverbergh 1364;* Ifugao Subprovince, Mount Polis, *McGregor 19930* form: Cagayan Province, Mount Babotugin, *Edaño 79805a.* MINDORO, Puerto Galera, *Bartlett 13873* in part. NEGROS, Oriental Negros Province, Cuernos Mountains, *Elmer 9974* (type). MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11868;* Lanao Province, Palao Amopo, *Bartlett 15959a, 15967a.*

Endemic.

On trees. The spore measurements in the description of *S. subulata* are misleading. An examination of a mature, deoperculate capsule from the type collection shows them to be up to 45 µ in diameter. There is no constant difference in the branching, so I am forced to conclude that *S. Elmeri* and *S. subulata* are conspecific. *No. 19930* is a very unusual form with numerous long microphyllous branches which I believe can be referred here through the structural agreement of the normal leaves.

3. SYMPHYSODONTELLA ATTENUATULA Fleisch. Plate 16, fig. 267.

Symphysodontella attenuatula FLEISCH., Laubmfl. Java 3 (1906) 695.

Secondary stems rigid, up to 4 cm high, rather densely pinnate and more or less frondose from a short stipe, branches often attenuate at tips but rarely flagelliform. Leaves erect-spreading, slightly complanate, 2 mm long, oblong-lanceolate, deeply concave, contracted to a short-acuminate point; margins erect, entire, strongly inflexed above; costa single, ending in upper third of leaf; cells long and narrow with firm walls, short, porose, and colored across the insertion. Perichætium large, inner leaves long subulate-acuminate, reaching base of capsule; seta slender, 2 mm long, minutely scabrous above; capsule exserted, ovoid-cylindric, urn 2 to 2.5 mm long; peristome teeth pale yellow, smooth, narrow, slightly furrowed below, with knoblike thickenings toward base, deeply inserted; calyptra slightly scabrous above; spores large.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 2152*.

Distribution: Java.

On trees. The only local specimen known is in fine fruit and very distinct through the exserted capsules.

4. SYMPHYSODONTELLA CYLINDRACEA (Mont.) Fleisch. Plate 16, fig. 269.

Symphysodontella cylindracea (Mont.) FLEISCH., Laubmfl. Java 3 (1906) 692.

Neckera cylindracea MONT., Ann. Sci. Nat. (1848) 109; Syll. (1856) 23.

Secondary stems rigid, more or less frondose from a short stipe, up to 5 cm long or longer. Leaves oblong-ovate, deeply concave, abruptly short-acuminate; margins entire, broadly inflexed above; costa faint, variable, short and double or unequally forked with one branch extending nearly to midleaf; cells as in *S. subulata*. Seta very short; capsule immersed, cylindrical, narrowed toward mouth, urn up to 3 mm long; peristome as in *S. subulata*.

MINDORO, Puerto Galera, *Bartlett 13874* in part. MINDANAO, Davao Province, Mount Apo, *Williams 2660*.

Distribution: Sumatra, Java, New Caledonia, Aneityum, Pacific Islands.

On trees. A species of wide distribution in the Pacific Islands, which seems to fade out and become rare in Malaysia. It is distinguished from the other local species by the short-pointed leaves with a short, faint costa.

26. Family METEORIACEÆ

Slender or robust plants, often pendent from trees in feathery masses. Primary stems filiform, creeping, secondary stems elongate, flexuose, branched, densely foliate. Leaves ovate-lanceolate, acuminate; costa usually single, slender, ending below apex; cells elongate, often papillose, alar group rarely well defined. Capsule usually exserted on a slender, short seta; peristome double; lid short; calyptra small, cucullate, often pilose. Fruit rare.

Key to the genera of Meteoriaceæ.

1. Leaves erect, appressed .... 2.
   Leaves widely spreading .... 3.
2. Dull plants, stems slender, leaf cells obscure, pluripapillate. 95. *Papillaria.*
   Glossy plants, stems tumid, leaf cells distinct, unipapillate. 96. *Meteorium.*
3. Dull plants, leaf cells seriate-papillose .... 98. *Floribundaria.*
   Glossy plants, leaf cells smooth or unipapillate .... 4.
4. Leaves erect-spreading, cells usually papillose .... 5.
   Leaves horizontal or recurved, cells smooth .... 6.
5. Slender plants, leaf cells smooth or faintly papillate .... 99. *Barbella.*
   Robust plants, leaf cells uniformly unipapillate .... 97. *Aerobryopsis.*
6. Leaves 2 mm wide or wider, horizontally spreading ... 101. *Aerobryum.*
   Leaves 1 mm wide or narrower, points deflexed .... 100. *Meteoriopsis.*

95. Genus PAPILLARIA Jaeg. and Sauerb.

Papillaria JAEG. & SAUERB., Adumbr. 2 (1875-1876) 167.

Slender plants without lustre. Secondary stems more or less terete, numerous, often pendent in intricate masses. Leaves erect, laxly or closely imbricated, more or less plicate, acuminate, often auriculate at basal angles; costa single, to or beyond midleaf; cells narrowly elliptical, incrassate, obscure, finely papillose, basal cells pellucid, smooth near costa. Capsule immersed or exserted, ovoid, erect; peristome double, segments of endostome from a low basal membrane; calyptra small, usually more or less pilose.

Key to the species of Papillaria.

Leaves laxly erect, upper cells elongate........................ 1. *P. fuscescens.*
Leaves closely appressed, upper cells short........................ 2. *P. crocea.*

1. PAPILLARIA FUSCESCENS (Hook.) Jaeg. Plate 16, fig. 269.

Papillaria fuscescens (Hook.) JAEG., Adumbr. 2 (1875–1876) 174.
Neckera fuscescens HOOK., Musc. Exot. (1819) *pl.* 157.

Dioicous; secondary stems often very long, pendulous, in dense, intricate masses, yellow at tips, brown or black below, distantly pinnate, branches short and widely spreading. Leaves laxly erect, lightly plicate, about 2 mm long, oblong-lanceolate from a strongly auriculate base, acuminate, apex twisted in a half turn; margins plane, sharply serrulate especially around auricles and at apex; costa pale, ending about midleaf; cells linear-rhomboidal, with firm, pale walls, obscure, minutely seriate-papillose over lumens and walls, more pellucid at base, yellow across insertion, lower juxtacostal cells smooth. Branch leaves similar but smaller. Perichætium large; capsule immersed, cylindric; calyptra pilose.

LUZON, Abra Province, Mount Posucy, *Ramos 27093*: Bontoc Subprovince, Mount Cana, *Ramos & Edaño 38222*: Benguet Subprovince, Tonglon, *Merrill 7829*; Baguio, *Williams 1699*. MINDORO, Puerto Galera, *Bartlett 13579* in part. NEGROS, Oriental Negros Province, Cuerno de Negros, *Megdamo 57*.

Distribution: Himalayas, Ceylon, Yunnan, Siam, and wide in Malaysia.

On trees and rocks in elevated forests. Clearly marked by the laxly appressed leaves with very large, undulate basal auricles.

2. PAPILLARIA CROCEA (Hampe) Jaeg. Plate 16, fig. 270.

Papillaria crocea (Hampe) JAEG., Adumbr. 2 (1875–1876) 171.
Pilotrichum croceum HAMPE, Linnæa 25 (1852) 715.
Papillaria cuspidifera (Tayl.) JAEG., Adumbr. 2 (1875–1876) 170.

Secondary stems slender, wiry, laxly pinnate, densely foliate, stems and branches julaceous, rich golden brown, paler at tips. Leaves erect, rigidly appressed, lightly plicate, up to 1.8 mm long, nearly 1 mm wide, ovate-lanceolate from a broadly cordate, auriculate base, finely acuminate; margins crenulate around auricles, subentire above; costa yellow, ending near apex; cells short, oval, very obscure and densely papillose, marginal row more incrassate and distinct, abruptly paler and hyaline or pellucid at base, interior basal cells elongate, incrassate and smooth, in auricles transversely oval in divergent rows. Sporophyte not seen.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 20322*: Benguet Subprovince, Mount Santo Tomas, *Williams 9159*, *Bartlett 13273*.

Distribution: Northern India, Ceylon, Java, Australia, New Zealand, Kermadec, Fiji.

On trees. The few Philippine collections available seem to belong to this widely distributed species which will be recognized by the slender, julaceous stems and the broad leaves with short, very opaque upper cells.

96. Genus METEORIUM Doz. and Molk.

Meteorium Doz. and MOLK., Musc. Archip. Ind. ined. (1854) 167.

Rather robust, glossy plants. Secondary stems long, pendulous, distantly pinnate, densely foliate and tumid. Leaves broadly ovate, plicate, abruptly subulate-acuminate; costa single, slender; cells long and narrow, unipapillate. Seta slender, short; capsule exserted, erect; peristome double; calyptra pilose.

Key to the species of Meteorium.

Upper leaf margins papillose-crenulate .... 1. *M. Miquelianum.*
Upper leaf margins sharply toothed .... 2. *M. helminthocladum.*

1. METEORIUM MIQUELIANUM (C. M.) Fleisch. Plate 16, fig. 111.

Meteorium Miquelianum (C. M.) FLEISCH., E. and P. Pflanzenfam. ed. 1 Musci (1906) 818.

Neckera Miqueliana C. M., Syn. 2 (1851) 133.

Dioicous; secondary stems in dense intricate masses, golden green tinged with brown, branches distant, short, widely spreading. Leaves crowded, concave, deeply plicate, cordate and broadly auriculate at base, up to 3 mm long, broadly ovate, abruptly rounded at apex and contracted to a slender, subulate point; margins minutely crenulate all around, undulate and irregularly inflexed; costa slender, ending near base of acumen; cells linear-rhomboidal, incrassate, sharply unipapillate, shorter and porose near insertion. Seta 3 to 4 mm long, curved, smooth or slightly scabrous; capsule ovoid, erect; peristome teeth papillose, more or less split along median line, segments of endostome narrow from a low basal membrane; calyptra sparsely pilose.

LUZON, Ifugao Subprovince, Polis, *McGregor 19937, 20303*: Benguet Subprovince, Mount Data, *Hadden 191*; Baguio, *Bart-*

lott 13302, Topping 183; Pauai, *Copeland 1925;* form; Mount Pulog, *McGregor 8910;* Pampanga Province, Mount Arayat, *Ramos 22450.* NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 4.* PANAY, Iloilo Province, Ulian River, *Robinson 18257;* Antique Province, Culasi, *McGregor 5346.* MINDANAO, Agusan Province, *Weber 1327.*

Distribution: Northern India, Ceylon; wide in Malaysia, New Guinea, China, Japan, Fiji.

On trees in elevated forests. A very protean species with numerous variants in size, habit and leaf structure but usually easy to recognize by the tumid, glossy stems and plicate, abruptly pointed leaves. *No. 1925* is an unusually soft form with nearly smooth leaves ending in a long, crispate hairpoint, but I doubt if it is specifically distinct.

2. **METEORIUM HELMINTHOCLADUM** (C. M.) Fleisch. Plate 16, fig. 212.

Meteorium helminthocladum (C. M.) FLEISCH., Laubmfl. Java 3 (1907) 778.

Papillaria helminthoclada C. M., Nuov. Giorn. Bot. Ital. 3 (1896) 133.

Closely resembling *M. Miquelianum* but with the leaves more abruptly rounded and toothed near the apex and the cells broader and slightly more incrassate.

LUZON, Benguet Subprovince, Pauai, *Merrill 6671, McGregor 8691;* Mount Pulog, *Merrill 6397.*

Distribution: Ceylon, China, Japan, Formosa.

The plants referred to here differ so slightly that I am frankly skeptical of the value of the species as far as the local specimens are concerned. I have not seen the original from Shensi Province, China, but there is nothing noteworthy in the description, unless it be the indistinctly papillose leaf cells, which certainly does not apply to the Philippine plants.

97. Genus AEROBRYOPSIS Fleisch.

Aerobryopsis FLEISCH., Hedwigia 44 (1905) 304.

Robust, lustrous plants growing in soft, feathery masses. Secondary stems long, usually pendulous, laxly pinnate, branches densely foliate, more or less flattened. Leaves spreading, ovate, acuminate, smooth or undulate; costa slender, ending above midleaf; cells oval-rhomboidal or linear, distinctly unipapillate. Seta slender, elongate, more or less scabrous; capsule erect or curved, ovoid-cylindric; peristome teeth papillose, endostome with a low basal membrane; calyptra sparingly pilose.

Key to the species of Aerobryopsis.

1. Leaves transversely undulate, cells linear, 8 : 1 or 12 : 1.
1. *A. longissima.*
Leaves not undulate, cells oval, 4 : 1 or 5 : 1.. 2.
2. Leaves gradually narrowed to a rather broad, short point.
2. *A. philippinensis.*
Leaves broader, abruptly narrowed to a capillary point.... 3. *A. scariosa.*

1. **AEROBRYOPSIS LONGISSIMA** (Doz. and Molk.) Fleisch. Plate 14, fig. 271.

Aerobryopsis longissima (Doz. & Molk.) FLEISCH., Hedwigia 44 (1905) 305.

Neckera longissima Doz. & MOLK., Musc. Frond. n. sp. Archip. Ind. (1844) 18.

Meteorium lanosum MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 90.

Normally robust, glossy plants, pale or yellowish green strongly tinged with brown or black. Secondary stems long, flexuose, distantly pinnate, branches short, widely spreading, complanate. Leaves crowded, erect-spreading, up to 4 mm long, ovate lanceolate, gradually narrowed to a long, finely acuminate point, transversely undulate in upper half; margins denticulate, undulate above; costa slender, ending near base of acumen; cells linear or linear-rhomboidal, 4 to 5 µ wide and 30 to 45 µ long, with pale, firm walls, distinctly unipapillate over center of lumen, wider and porose toward base, not or hardly differentiated at basal angles. Capsule small, exserted on a slender seta.

LUZON, Benguet Subprovince, Mount Data, *Hadden 132;* Mount Santo Tomas, *Williams 1097;* Pauai, *Merrill 6674.*

Distribution: India, Ceylon, Malay Peninsula, Malaysia, China, Pacific Islands to Hawaii.

Usually on trees in elevated forests. A very plastic species of wide distribution. Curiously the typical robust form is uncommon in the Philippines.

AEROBRYOPSIS LONGISSIMA (Doz. & Molk.) Fleisch. var. **PROSTRATULA** (C. M.) Bartram comb. nov.

Neckera prostratula C. M., Linnaea 38 (1874) 600.

Smaller and slenderer than the typical form, with the leaves less strongly undulate.

LUZON, regione montosa, *C. Wallis.* Laguna Province, Mount Maquiling, *Bartlett 15779, 15797.* POLILLO, *McGregor 10514.* PANAY, Iloilo Province, Larena, *Robinson 18207.* NEGROS, Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 9484*. MINDANAO, Agusan Province, *Weber 1321*: Lanao Province, Palao Amopo, *Bartlett 15367b*.

Endemic.

A fairly well-defined variant in the slender habit and lightly undulate leaf points, but without any distinctions of major importance.

AEROBRYOPSIS LONGISSIMA (Doz. and Molk.) Fleisch. var. DOZYANA Fleisch.

Aerobryopsis longissima (Doz. & Molk.) Fleisch. var. *Dozyana* FLEISCH., Laubmfl. Java 3 (1907) 788.

Neckera Dozyana C. M., Syn. 2 (1851) 141, 162.

Secondary stems very slender, sparingly branched.

LUZON, Camarines Sur Province, Maagnus, *Robinson 6897*.

Distribution: Java, Hawaii.

An unusually slender, soft form.

1. AEROBRYOPSIS PHILIPPINENSIS Bartram sp. nov. Plate 16, fig. 274.

Caules secundarii penduli, flexuosi, pinnatum ramosi, ad 35 cm longi. Folia horride patentia, haud undulata, caulina e basi late cordato-ovata sensim piliformiter acuminata, ramea angustiora, late acuminata; costa in acumen producta; cellulæ superiores ovales, unipapillosæ, parietibus firmis, pallidis, basilares elongatæ, lævissimæ. Seta circa 15 mm longa, superne minute papillosa. Caetera ignota.

Secondary stems long, flexuose, pendulous, distantly pinnate, yellowish green toward tips, brown below, rather laxly foliate, complanate. Leaves divaricately spreading, smooth, not at all undulate, stem leaves from a broadly ovate, cordate base gradually narrowed to a fine hairpoint, branch leaves narrower, ovate-lanceolate, concave, narrowed to a rather broadly linear-acuminate point; costa ending in acumen near apex; upper cells short, oval or oval-rhomboidal, 4 to 5 μ wide and 15 to 20 μ long, distinctly unipapillate, more elongate and smooth toward base, shorter and porose across insertion. Seta (immature) 15 mm long, red, flexuose, minutely papillose above; calyptra sparsely pilose. Capsules undeveloped.

LUZON, Pampanga Province, Mount Pinatubo, Camp Stotsenburg, *Elmer 22088* (type): Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15858*; Bataan Province, Mount Mariveles, *Merrill 5551*. MINDORO, Puerto Galera, *Bartlett 13702*. PANAY, Antique Province, Culasi, near Flores, *McGregor 32634, 32649, 32650*. NEGROS, Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 9004, 9073*; Cuerno de Negros, *Magdamo 8, 95*.

Endemic.

Sharply distinct from *A. longissima* in the smooth leaves and shorter areolation. It is probably nearest *A. vitiana*, but the branch leaves are obviously more broadly pointed and the leaf cells much shorter.

3. **AEROBRYOPSIS SCARIOSA** Bartram sp. nov. Plate 16, fig. 215.

Robusta, nitida, atro-viridis. Caules secundarii sat dense pinnatim ramosi, ad 20 cm longi, densissime foliosi. Folia scariosa, horride patula vel deflexa, haud undulata, e basi latissime cordato-ovata abrupte in acumen piliformiter attenuata; costa tenuissima, ultra medium folii evanida; cellulae ovali-rhomboideae, unipapillosae, parietibus firmis, pallidis, porosis. Caetera ignota.

Robust, glossy plants in intricate masses, pale green at tips, dark brown or black below. Secondary stems up to 20 cm long, rather densely pinnate and bipinnate, branches spreading, blunt, 7 to 8 mm wide with leaves. Leaves thin and papery, horizontally spreading and deflexed, up to 4.5 mm long and 2 mm wide, from a broad, ovate, cordate base rather quickly narrowed to a short, flexuose capillary point which is often hyaline at tip; margins minutely denticulate, broadly inflexed on one side below; costa slender, ending below base of acumen; cells oval-rhomboidal, porose, with firm, pale walls, 4 to 5 μ wide and 18 to 25 μ long, distinctly unipapillate, laxer and paler yellow across insertion. Sporophyte unknown.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13310*.

Endemic.

On rocks. An unusually handsome plant, richly colored and very glossy. It is much more robust than *A. philippinensis* and quite distinct in the broader leaves ending in fine capillary points. *A. Wallichii* (Brid.) is a smaller plant with different-shaped leaves and long narrow leaf cells. In general appearance the plants resemble *Aerobryum speciosum*, but the papillose leaf cells are, of course, quite distinctive.

98. Genus FLORIBUNDARIA C. M.

Floribundaria C. M., Linnæa 40 (1876) 267.

Slender, pale-green plants growing in loose leathery masses. Stems long, prostrate, pinnately branched, branches short or elongate, flattened. Leaves widely spreading, narrowly ovate-lanceolate, acuminate; costa single, faint and short; cells linear, usually seriate-papillose. Seta short, smooth; capsule ovoid, erect; peristome teeth striolate, segments of endostome keeled, from a high basal membrane; calyptra small, cucullate, sparingly pilose.

Key to the species of Floribundaria.

1. Branches bipinnate .... 3. *F. thuidioides.*
   Branches irregularly pinnate .... 2.
2. Leaves of primary branches broadly cordate at base, papillæ scattered.
   2. *F. pseudo-floribunda.*
   Leaves of primary branches ovate at base, papillæ seriate.
   1. *F. floribunda.*

1. **FLORIBUNDARIA FLORIBUNDA** (Doz. and Molk.) Fleisch. Plate 14, fig. 274.

Floribundaria floribunda (Doz. & Molk.) FLEISCH., Hedwigia 44 (1905) 302.

Leskea floribunda Doz. & MOLK., Ann. Sci. Nat. 2 (1844) 310.

Very slender, feathery plants, dull yellow or pale green, in lax intricate masses. Stems up to 20 cm long or longer, flexuose, branches simple or once-pinnate. Stem leaves laxly erect, long and finely acuminate; branch leaves widely spreading, ovate-lanceolate, more broadly acuminate, 1 to 2 mm long, usually broadly inflexed on one side at base; margins plane, serrulate; costa single, very faint, scarcely reaching midleaf; cells linear, opaque, 2 to 3 µ wide and 10 to 15 times as long, with several small, sharp papillæ in a vertical row over lumens, near insertion slightly wider, smooth and pellucid, alar cells few and poorly differentiated. Seta 3 mm long, erect or curved; capsule erect, urn 2 mm long, ovoid-cylindric, peristome large; spores papillose, 20 to 25 µ.

Frequent in Luzon, Mindoro, Panay, Negros, Palawan, and Mindanao.

Distribution: Wide; Pacific Islands to Hawaii, Malaysia, Tonkin, Japan, India, Africa.

On twigs and leaves in damp forests, rarely on rocks. This delicate, feathery moss is probably not uncommon on all the larger islands. The habit is quite characteristic and it is not likely to be confounded with any but the two allied species. Some of the slenderer forms may well be referred to the variety *capillirameа* (C. M.), but the intergrades are so gradual that I doubt if any of the numerous varieties can be segregated with much satisfaction.

3. FLORIBUNDARIA PSEUDO-FLORIBUNDA Fleisch. Plate 16, fig. 277.

Floribundaria pseudo-floribunda FLEISCH., Hedwigia 44 (1905) 302.

Resembling *F. floribunda*, but slightly more robust and with longer branch leaves. Leaves of primary branches triangular-lanceolate from a cordate base; leaves of ultimate branches gradually narrowed to a long, slenderly acuminate point; cells opaque, papillæ scattered, not seriate.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 19941*; Rizal Province, *Reillo 19823*.

Distribution: Java, Queensland, New Hebrides, New Guinea.

On trees. As in most species with a wide distribution *F. floribunda* presents many variants without any clean-cut distinctions. The forms included here and under *F. thuidioides* are not very convincing as species and may finally have to take a subordinate rank under *F. floribunda* as broadly interpreted.

4. FLORIBUNDARIA THUIDIOIDES Fleisch. Plate 16, fig. 278.

Floribundaria thuidioides FLEISCH., Hedwigia 44 (1905) 302.

More densely branched than *F. floribunda*, branches irregularly bipinnate. Leaves of primary branches from a cordate-ovate base gradually narrowed to a fine acuminate point, up to 2.5 mm long; leaves of secondary branches shorter, triangular-lanceolate from a cordate base, broadly acuminate; cells opaque, papillæ scattered, not obviously in vertical rows.

PALAWAN, Mount Balagbag, *Edaño 80903*. MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 2671*.

Distribution: Java.

On trees. Distinguished principally by the bipinnate arrangement of the secondary branches.

99. Genus BARBELLA (C. M.) Fleisch.

Barbella (C. M.) FLEISCH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 823.

Filotrichella § *Barbella* C. M., Flora 82 (1896) 464.

Slender, glossy plants, usually pendent in loose masses. Secondary stems elongate, pinnately branched, ultimate branches often filiform. Leaves narrowly lanceolate, slenderly acuminate; costa single and short or none; cells linear, smooth or faintly papillose. Seta short; capsule exserted, erect or nodding; peristome double; calyptra small.

Key to the species of Barbella.

1. Ultimate branches not filiform, branch leaves spreading........ 2.
   Ultimate branches filiform, branch leaves mostly appressed........ 4.
2. Costa none........ 1. *B. comes.*
   Costa single, to about midleaf........ 3.
3. Leaves with long capillary hairpoints........ 2. *B. rufifolioides.*
   Leaves acuminate, not hairpointed........ 3. *B. Clemensiae.*
4. Leaf base strongly auriculate........ 4. *B. macroblasta.*
   Leaf base without auricles........ 5.
5. Costa faint or none........ 5. *B. enervis.*
   Costa single to about midleaf........ 6.
6. Leaves linear-lanceolate, spreading on ultimate branches, cells obscure.
   6. *B. horridula.*
   Leaves ovate, lanceolate, appressed on ultimate branches, cells distinct.
   7. *B. pendula.*

1. **BARBELLA COMES** (Griff.) Broth. Plate 17, fig. 279.

Barbella comes (Griff.) BROTH., E. & P. Pflanzenfam. 1 Musci (1906) 824.

Neckera comes GRIFF., Icones Pl. Asiat. (1849) *pl. 86, fig. 2.*

Slender, delicate plants, pale brownish green, glossy. Secondary stems numerous, pendulous, up to 25 cm long, copiously branched, branches irregularly pinnate, laxly foliate. Leaves widely spreading, ovate-lanceolate, long-acuminate, concave, 1.5 to 2 mm long; margins erect, inflexed and serrate toward apex; costa none; cells smooth, narrowly linear, 3 to 4 μ wide and 8 to 12 times as long, thin-walled, much shorter, incrassate and porose across insertion, without any well-defined alar group. Seta 2 to 3 mm long; capsule small, ovoid, erect; peristome teeth papillose.

LUZON, Benguet Subprovince, Baguio, *Elmer 8886.*

Distribution: Himalayas, Ceylon, Sumatra, Java.

On trees. Although this collection lacks fruit, the spreading, ecostate leaves of the slender ultimate branches are quite distinctive.

2. **BARBELLA RUFIFOLIOIDES** (Broth.) Broth. Plate 17, fig. 280.

Barbella rufifolioides (Broth.) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 163.

Chrysocladium rufifolioides BROTH., Philip. Journ. Sci. § C 5 (1910) 153.

Dioicous? Relatively robust pendulous plants, golden brown, slightly glossy. Secondary stems about 10 cm long, irregularly pinnate, laxly foliate, complanate. Leaves widely spreading, 2.5 to 3 mm long, ovate-lanceolate from a cordate base, gradually narrowed to a long, fine, capillary hairpoint, broadly inflexed on one side at base; margins sharply serrate all around; costa slender, faint, ending above midleaf; cells opaque, narrowly linear, 3 µ wide and 10 to 15 times as long, with several small, sharp papillæ over lumens, more incrassate and porose across insertion, alar cells rounded quadrate, brownish, in a small group. Sporophyte unknown.

LUZON, Benguet Subprovince, Mount Pulog, *McGregor 8914*.

Endemic.

A unique species in the ruddy coloring, the long capillary pointed branch leaves, and the obscure, sharply papillose leaf cells. The ultimate branches are not at all filiform.

3. **BARBELLA CLEMENSIAE** Broth. Plate 17, fig. 181.

Barbella Clemensiae BROTH., Philip. Journ. Sci. § C 13 (1918) 210.

Slender, soft, pendulous plants, bright golden yellow, very glossy. Secondary stems up to 15 cm long, distantly pinnate, branches widely spreading, complanate, frequently attenuate and flexuose but not filiform. Stem leaves laxly erect, ovate-lanceolate, gradually long and slenderly acuminate, minutely denticulate; branch leaves widely spreading, 2 mm long, ovate-lanceolate, broadly acuminate, sharply serrate all around; costa slender, ending a little above midleaf; cells linear, 3 to 4 µ wide and 12 to 20 times as long, minutely papillose over lumens, shorter and laxer across insertion, alar cells subrectangular, faintly colored, in a small group. Sporophyte unknown.

LUZON, Benguet Subprovince, Pauai, *M. S. Clemens 9317*.

Endemic.

Paler and more glossy than *B. rufifolioides*, with conspicuously broader-pointed branch leaves and more pellucid, distinct areolation.

4. **BARBELLA MACROBLASTA** Broth. Plate 17, fig. 212.

Barbella macroblasta BROTH., Philip. Journ. Sci. § C 8 (1913) 79.

Slender, soft, lustrous plants, yellowish or pale brown. Secondary stems pendulous, to 20 cm long or longer, remotely pinnate, laxly foliate, branches short and complanate or long and flexuose, complanate at base becoming flagelliform with laxly appressed leaves. Stem leaves and complanate branch leaves laxly appressed, from a broadly auriculate, hastate base gradually lanceolate-acuminate, ending in a long, flexuose, minutely denticulate, capillary hairpoint; margins denticulate all around; cells pellucid, smooth, linear-rhomboidal, 10 µ wide and 8 to 10 times as long, laxer and more porose near insertion, alar cells numerous, irregularly hexagonal, hyaline, in a well-defined rounded group. Leaves of flagelliform branches narrower, more coarsely serrate and with very long, capillary points. Sporophyte unknown.

LUZON, Bontoc Subprovince, *Vanoverbergh 528*.

Endemic.

On trees. Sharply distinct from all the allied species with flagelliform branches in the broadly auriculate leaf base and broader cells.

5. BARBELLA ENERVIS (Mitt.) Fleisch. Plate 17, fig. 283.

Barbella enervis (Mitt.) FLEISCH., E. & P. Pflanzenfam. ed. 2 Musci (1906) 824.

Meteorium enerve MITT., Journ. Linn. Soc. 13 (1873) 317.

Slender, soft plants, pale brown, glossy. Secondary stems 20 cm long or longer, remotely pinnate, branches mostly elongate, flexuose and flagelliform. Lower leaves spreading, complanate, ovate-lanceolate from a subcordate base, gradually narrowed to a linear-acuminate point, ecostate; margins distantly denticulate; cells linear-rhomboidal, 6 to 8 μ wide and 10 to 15 times as long, smooth or lightly papillose, laxer and more porose near insertion, alar cells irregularly angular, in a small group. Leaves of flagelliform branches more appressed, narrower, with longer capillary points, cell more distinctly papillose. Sporophyte not seen.

LUZON, Benguet Subprovince, Pauai, *Copeland 1829;* Baguio, *Merrill 7848:* Bontoc Subprovince, Bauco, *Vanoverbergh 980:* Tayabas Province, Infanta, *Robinson 9891*. MINDANAO, Agusan Province, *Weber 1317*.

Distribution: Himalayas, Ceylon, Australia, Lord Howe Island, New Caledonia.

On trees. This species has the typical slender, pendulous habit of its immediate allies, but is distinct from all but *B. macroblasta* in the nerveless leaves.

6. BARBELLA HORRIDULA Broth. Plate 17, fig. 284.

Barbella horridula BROTH., Philip. Journ. Sci. § C 8 (1913) 78.

Slender, feathery plants in lax, pendent tufts, pale yellow, slightly glossy. Stems elongate, radiculose in tufts where in contact with substratum, laxly foliate, copiously branched, branches short and complanate or long and flagelliform with distant spreading leaves. Stem leaves erect-spreading, narrowly lanceolate, gradually narrowed to a long, slender, subulate-acuminate point; margins minutely denticulate; costa faint, ending near midleaf; cells narrowly linear, papillose, rather obscure. Branch leaves longer, up to 2.5 mm long, horizontally spreading, margins sharply serrulate. Sporophyte unknown.

LUZON, Benguet Subprovince, Sablang, *Fenix 12807*.

Endemic.

On shrubs in shaded ravines. As far as one can judge from a single collection this species is very distinct. The main stem and branches are closely applied to the bark by tufts of radicles. The branch leaves are widely spaced and widely spreading, even along the elongate tips, giving the plants a distinctly feathery appearance.

7. **BARBELLA PENDULA** (Sull.) Fleisch. Plate 17, fig. 285.

Barbella pendula (Sull.) FLEISCH., Laubmfl. Java 3 (1907) 812.
Meteorium? pendulum SULL., Mosses of U. S. (1856) 81.
Barbella elongata WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 356.

Very slender, delicate, glossy, pendent plants, pale yellowish green. Stems to 50 to 60 cm long, irregularly pinnate, branches distant, widely spreading, slenderly attenuate. Leaves laxly erect; stem leaves 2.5 to 3 mm long, ovate-lanceolate, gradually tapering to a long, filiform point; margins erect, distantly serrulate; costa faint, ending slightly above midleaf; cells very long and narrow, 3 to 4 μ wide and 10 to 15 times as long, faintly papillose, alar cells short, angular, in a small distinct group. Branch leaves similar but smaller, with rather wider cells. Sporophyte lateral on ultimate branches; seta 2 to 3 mm long, slightly curved, minutely scabrous above; capsule erect, oblong-cylindric, tapering to seta, urn 2 to 2.5 mm long; peristome teeth transversely striolate, segments of endostome narrow from a rather low basal membrane.

LUZON, Benguet Subprovince, Mount Data, *Hadden 155*, *Merrill 6673*; Mount Santo Tomas, *Williams 1894*; Ifugao Subprovince, Mount Polis, *McGregor 20312*; Laguna Province, Mount Banahao, *Merrill 7531*.

Distribution: Ceylon, Sumatra, Java, China, Japan, Formosa, southern United States.

On branches of trees. I can find no distinctions between *B. pendula* and *B. elongata* Williams. In a general way the sporophyte characters of the latter compare closely with Sullivant's plate, and there is certainly nothing distinctive in the foliage.

B. pendula is slenderer than any of the other local species. The leaves are appressed, so that the stem and branches are terete and filiform.

100. Genus METEORIOPSIS Fleisch.

Meteoriopsis FLEISCH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 825.

Rather robust, pendulous, glossy plants. Secondary stems elongate, irregularly pinnate, densely foliate; ultimate branches coarse and blunt. Leaves squarrose-spreading with deflexed points, ovate-lanceolate from an erect clasping base, long-acuminate, serrulate; costa single, faint, ending near midleaf; cells narrow, linear-rhomboidal, papillose alar group inconspicuous. Sporophyte lateral on ultimate branches; capsule erect, slightly exserted; seta very short; peristome double; calyptra small, mitriform, pilose.

Key to the species of Meteoriopsis.

Leaf cells more or less opaque, pluripapillate.................... 1. *M. reclinata.*
Leaf cells pellucid, unipapillate to smooth........................ 2. *M. squarrosa.*

1. **METEORIOPSIS RECLINATA** (Mitt.) Fleisch. Plate 11, fig. 264.

Meteoriopsis reclinata (Mitt.) FLEISCH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 826.

Meteorium reclinatum MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 87.

Dioicous; yellowish-green, glossy plants growing in dense masses. Secondary stems to 20 cm long but often much shorter, irregularly pinnate, coarse and wiry. Leaves crowded, squarrose spreading from an erect base on all sides, usually with points neatly and uniformly deflexed, ovate-lanceolate from a broad, clasping base quickly narrowed to a slender, flexuose or undulate, denticulate point; margins serrulate all around, more or less undulate above; costa faint, ending just above midleaf; cells linear-rhomboidial, 5 µ wide and 8 to 10 times as long, rather opaque, with 1 to 3 small papillæ over lumens, more elongate and smooth toward base, short and angular at basal angles in a small alar group. Perichætium small; seta 1.5 to 2 mm long, slightly curved; capsule exserted, erect, ovoid-cylindric, urn 2.5 to 3 mm long, tapering to seta, becoming black with age; peristome teeth transversely striolate, segments of endostome rather broad, keeled, from a basal membrane nearly half height of teeth; calyptra pilose.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 20306* in fruit: Benguet Subprovince, Baguio, *Williams 1692*, *Sanchez 1*, 8, *Robinson 14012, 14021, Merrill 7874, Fenix 12940:* Bontoc Subprovince, *Vanoverbergh 1974, 1743;* Mount Masapilid, *Ramos & Edaño 38248:* Nueva Vizcaya Province, Dupax, *McGregor 14345;* Campote, *McGregor 20223:* Rizal Province, *Reillo 19928.*

Distribution: Nilghiri, Ceylon, Java, Celebes, Formosa.

On trees. Not known locally outside of Luzon. This species is easily recognized by the neatly deflexed leaf points. The distinctions, such as they are, between this species and *M. squarrosa* are intangible. I have referred several collections with more pellucid, lightly papillose to smooth leaf cells to the following species, but not without considerable uncertainty.

1. **METEORIOPSIS SQUARROSA** (Hook.) Fleisch. Plate 17, fig. 237.

Meteoriopsis squarrosa (Hook.) FLEISCH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 820.

Neckera squarrosa HOOK., Ic. Pl. Rar. (1837) *pl. 22, fig. 3.*

Robust plants with the habit of the larger forms of *M. reclinata.* Leaves ovate-lanceolate from an erect, clasping, obovate base, slenderly or filiform-acuminate; cells narrowly rhomboidal, pellucid, smooth or with one or two faint papillæ over lumens, laxer and slightly porose near insertion. Sporophyte not seen.

LUZON, Benguet Subprovince, Baguio, *Robinson 14012, Baker 3848.*

Distribution: Himalayas, Ceylon, Malay Peninsula, Siam, Sumatra, Java.

On trees. These collections show the leaves just as slenderly acuminate as in *M. reclinata,* but the cells are pellucid, distinct, and nearly smooth.

101. Genus AEROBRYUM Doz. and Molk.

Aerobryum DOZ. & MOLK., Nederl. Kruidk. Arch. 2 (1846) 279.

Robust, glossy plants with long, sparingly branched, laxly leaved secondary stems. Leaves scariose, widely spreading, broadly ovate, acuminate, serrulate; costa single, faint, ending near midleaf; cells linear, smooth. Sporophyte on ultimate branches; seta slender, smooth; capsule suberect, exserted, peristome double, hypnoid in structure.

AEROBRYUM SPECIOSUM Doz. and Molk. Plate 17, fig. 238.

Aerobryum speciosum DOZ. & MOLK., Nederl. Kruidk. Arch. 2 (1846) 279.

Pseudoautoicous; male plants minute. Secondary stems pendulous, to 40 to 50 cm long, distantly and irregularly pinnate; laxly foliate, 8 to 10 mm wide with leaves, yellowish green toward tips, pale brown or reddish brown below. Leaves up to 4 mm long and 2 mm wide, broadly ovate from a subcordate base, quickly narrowed to a short, finely acuminate point, broadly inflexed on one or both sides below; costa very slender, hardly reaching midleaf; cells linear, smooth, pellucid, laxer, incrassate and porose across insertion, without any well-defined alar group. Perichætium small; seta suberect, smooth, about 6 mm long; capsule ovoid, slightly nodding, urn 2 mm long; lid long-beaked from a conic base, oblique; calyptra cucullate, sparingly pilose when young; peristome teeth transversely striolate, segments of endostome widely split, from a high basal membrane, with 2 to 3 intermediate nodulose cilia; spores papillose, 16 to 20 μ.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1687*: Ifugao Subprovince, Mount Polis, *McGregor 20902, Vanoverbergh 1270*. MINDANAO, Davao Province, Mount Apo, *Copeland 986*.

Distribution: Northern India, Ceylon, Java, Amboina, Celebes, China.

On branches of trees. A magnificent moss that cannot readily be confused with anything else. The broad, widely spreading leaves are thin, papery, and very lustrous.

27. Family PHYLLOGONIACEÆ

Very glossy plants with sparingly branched, strongly flattened secondary stems. Leaves rigid, equitant, distichous, cymbiform, abruptly short-pointed, ecostate. Cells linear, smooth, alar group not differentiated.

102. Genus ORTHORRHYNCHIUM Reichd't.

Orthorrhynchium REICHD'T., Verh. Zool. Bot. Wien (1868) 116.

Primary stems filiform, creeping. Secondary stems erect or subpendulous, simple or branched, very flat. Leaves closely set in two rows, widely spreading, distichous, cymbiform, linear-oblong, abruptly short-pointed, entire; cells long and narrow, smooth; costa very short and faint or none.

ORTHORRHYNCHIUM PHYLLOGONIOIDES (Sull.) E. G. Britt. Plate 17, fig. 184.

Orthorrhynchium phyllogonioides (Sull.) E. G. BRITT. in herb.
Neckera phyllogonioides SULL., Proc. Amer. Acad. 3 (1855) 183; Wilkes U. S. Explor. Exped. (1859) 20, *pl. 17a*.
Orthorrhynchium philippinense C. M., Linnæa (1869) 30.

Dioicous; secondary stems erect, rigid, simple or forked, glossy, flat, pale green, 3 to 4 mm wide with leaves and up to

4 cm long. Leaves distichous, erect-spreading, smooth, cymbiform, narrowly oblong, entire, to 3 mm long, abruptly acute with the short point slightly recurved; costa very short and faint, usually forked; cells linear, 5 μ wide and 15 to 20 times as long, smooth, slightly vermicular, shorter and broader near apex and base, porose and pale yellow across insertion, larger, rectangular, and hyaline at basal angles forming a conspicuous alar group on one side and a smaller group on the other side. Sporophyte unknown. Clusters of septate gemmæ often present in leaf axils.

LUZON, *Wilkes U. S. Explor. Exped.* (type). MINDANAO, Lanao Province, Pugsan Hill, *Bartlett 15935a.* BASILAN, *C. Semper.*

Distribution: Java, New Guinea, Christmas Islands.

On trees. These collections are represented by relatively small plants about 2 cm high, and are the only local records as far as I know. The species should be recognized at sight by the long, rigid leaves in two rows, closely set edge to edge in the form of a compact, narrow frond. It appears to be rare.[*] Further collections indicating its local distribution will be very welcome.

26. Family NECKERACEÆ

Usually robust, glossy plants. Primary stems filiform, creeping; secondary stems erect or pendulous, subpinnate, strongly flattened. Leaves complanate, often transversely undulate, short-pointed; costa usually single, rarely double and short; cells smooth, rhomboidal above, linear toward base. Sporophyte lateral on branches of secondary stems; capsule immersed or exserted; peristome double, endostome with narrow segments, usually from a well-developed basal membrane.

Key to the genera of Neckeraceæ.

1. Leaves auriculate, auricles often large .... 103. *Calyptothecium.*
Leaves not auriculate .... 2.
2. Costa ending well below apex, mostly glossy plants .... 3.
Costa nearly percurrent, dull plants .... 5.
3. Leaves in 8 rows, stems more or less flattened, costa stout. 105. *Himantocladium.*
Leaves in 4 rows, stems very flat, costa slender .... 4.

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[*] In the Journal of Botany 43 (1904) 342 (Some Cryptogams from Christmas Island) Gepp recognizes the fact that *Neckera phyllogonioides* Sull. and *O. philippinense* C. M. are conspecific, but overlooks the undoubted priority of *N. phyllogonioides* Sull. which was validly published in 1855.

4. Leaves undulate, stems long and pendulous, sparingly branched. 104. *Neckeropsis.*
Leaves not undulate, stems frondose, copiously branched. 106. *Homaliodendron.*
5. Plants plumose, usually regularly and densely pinnate, seta short, papillose .... 107. *Pinnatella.*
Plants dendroid, irregularly branched, seta elongate, smooth. 108. *Thamnium.*

103. Genus CALYPTOTHECIUM Mitt.

Calyptothecium MITT., Journ. Linn. Soc. Bot. 10 (1868) 190.

Dioicous; robust, glossy plants. Secondary stems erect or pendulous, densely or distantly pinnate, branches flattened, blunt at ends. Leaves crowded, in 8 rows, often transversely undulate and usually conspicuously auriculate, oblong-lanceolate or lingulate, short-acuminate, serrulate; costa slender, ending above midleaf; cells linear, smooth, laxer and more porose across insertion. Capsule immersed; peristome teeth smooth, segments of endostome from a very low basal membrane.

Key to the species of Calyptothecium.

1. Leaf base broadly cordate but scarcely auriculate .... 2.
Leaf base strongly auriculate .... 4.
2. Secondary stems flexuose, irregularly branched .... 4. *C. MacGregorii.*
Secondary stems rigid, densely pinnate .... 3.
3. Leaf apex rounded, apiculate, serrulate .... 1. *C. crispulum.*
Leaf apex obtuse, coarsely serrate .... 2. *C. luzonense.*
4. Stems and branches strongly complanate, not tumid .... 6. *C. caudatum.*
Stems and branches slightly flattened and tumid .... 5.
5. Leaves smooth, sharply acuminate .... 5. *C. Ramosii.*
Leaves undulate, abruptly acute or obtuse .... 6.
6. Upper cells linear, costa slender, ending near midleaf, leaf apex acute. 3. *C. Urvilleanum.*
Upper cells rhomboidal, costa stout, ending near broad, obtuse apex. 7. *C. himantocladioides.*

1. CALYPTOTHECIUM CRISPULUM (Lac.) Broth. Plate 17, fig. 290.

Calyptothecium crispulum (Lac.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 839.

Neckera crispula LAC., Bryol. Jav. 2 (1863) 66.

Secondary stems up to 8 cm long, densely pinnate in a frondose head from a woody, stipelike base. Stipe leaves appressed; stem leaves crowded, complanate, strongly undulate, lingulate from a cordate base, apex broadly rounded and apiculate, to 2.5 mm long, inflexed on one side below, broadly rounded at basal angles but not clearly auriculate; margins denticulate toward apex; costa ending above midleaf; cells narrowly rhomboidal, 8 to 9 μ wide and 4 to 6 times as long, shorter near apex and more elongate toward base. Perichætium large; capsule immersed on a very short seta; peristome teeth yellowish, smooth, segments of endostome narrow from a scarcely evident basal membrane; calyptra naked, small.

MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 2670*.

Distribution: Nepal, Sumatra, Java.

On trees. Well distinguished from the allied species in the compactly frondose habit and the strongly undulate leaves.

1. CALYPTOTHECIUM LUZONENSE (Williams) Bartram comb. nov. Plate 17, fig. 191.

Neckera luzonensis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 358.

Secondary stems robust, up to 11 cm high, rigid, simple, and woody below, densely pinnate above in a large frond. Stipe leaves appressed; frond leaves complanate, strongly undulate, lingulate from an ovate, cordate base, obtuse, coarsely and bluntly serrate near apex, broadly inflexed on one side; costa ending near or above midleaf; cells rhomboidal, porose, 6 to 8 μ wide and 5 to 7 times as long, shorter in apex, more elongate below; stem leaves up to 3.5 mm long; branch leaves smaller, more sharply and irregularly toothed above.

LUZON, Mountain Province, Benguet Subprovince, Mount Santo Tomas, *Williams 1698*.

Endemic.

On tree trunks. More robust than *C. crispulum* but certainly a plant of this affinity. The leaf apex is coarsely toothed, especially in the leaves of the ultimate branches.

8. CALYPTOTHECIUM URVILLEANUM (C. M.) Broth. Plate 17, fig. 192.

Calyptothecium Urvilleanum (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1906) 839.

Neckera Urvilleana C. M., Syn. 2 (1851) 62.

Calyptothecium praelongum MITT., Journ. Linn. Soc. Bot. (1869) 190.

Calyptothecium philippinense BROTH., Monsunia 1 (1900) 48.

Secondary stems pale yellowish green, glossy, slender, flexuose, laxly or densely pinnate, very variable in habit, up to 40 cm long or longer, laxly foliate, slightly flattened, 3 to 4 mm wide with leaves, branches spreading, obtuse. Leaves about 3 mm long, laxly erect-spreading, concave, slightly undulate, oblong-ovate from a broad, cordate, strongly auriculate base, abruptly acute; margins serrulate toward apex, broadly inflexed below; costa slender, ending above midleaf; cells linear-rhomboidal, 5 μ wide, 35 to 50 μ long, smooth, more or less porose. Perichætium large; capsule immersed; peristome teeth smooth, yellowish, showing several layers of plates toward base, segments of endostome narrow from a low or rudimentary basal membrane; calyptra small, mitriform, densely pilose.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh 1317:* Benguet Subprovince, Mount Tonglon, *Ramos 5510;* Baguio, *Merrill 7834, 7853, Bartlett 13350, Williams 1690, 1691, Elmer 8397:* Sorsogon Province, Irosin, *Elmer 17268, 17269.* PALAWAN, Mount Mantalingahan, *Edaño 80856.* BILIRAN, *McGregor 18454, 18456.* NEGROS, Oriental Negros Province, Dumaguete, *Chapman 40.* MINDANAO, Davao Province, Mount Batangan, *Warburg;* Mount Apo, *Williams 2660:* Lanao Province, Pugaan Hill, *Bartlett 15926.*

Distribution: India, Malaysia to Fiji, Samoa, Caroline Islands, and Tahiti.

On trees. This species was confused with *Neckera tumida* Dicks. by Fleischer. Mr. Dixon has kindly made an examination of the original of *N. tumida* Dicks. and reports that it differs conspicuously from *C. philippinense* Broth. in the leaves having practically no auricles and a much stouter nerve. The habit of *N. tumida* is generally much shorter and the branching and foliation are denser, but this difference may not be constant, as *C. Urvilleanum* varies widely in this respect. It is unfortunate that *C. philippinense* must be dropped, but there seems to be no alternative. As far as my experience goes it is impossible to make any practical distinctions, and I am convinced that *C. Urvilleanum* may be used in an inclusive sense to cover the plants ranging from India through Malaysia to the islands of the Pacific. The large wrinkled leaf auricles are very characteristic.

4. CALYPTOTHECIUM MACGREGORII Broth. Plate 17, fig. 243.

Calyptothecium MacGregorii BROTH., Philip. Journ. Sci. § C 5 (1910) 154.

Plants with the habit of *C. Urvilleanum* but more robust. Secondary stems up to 6 mm wide with leaves. Stem leaves oblong-ovate, acute, scarcely auriculate or with auricles poorly defined.

LUZON, Benguet Subprovince, Mount Pulog, *McGregor 8913.*

Endemic.

The specimen in the Philippine National Herbarium, Bureau of Science, is quite fragmentary. It appears to be a distinct species, but may prove to be only a form of *C. Urvilleanum.*

3. **CALYPTOTHECIUM RAMOSII** Broth. Plate 75, fig. 294.

Calyptothecium Ramosii BROTH., Philip. Journ. Sci. § C 8 (1913) 80.

Secondary stems scattered, up to 5 cm long, rigid, pale yellowish green, glossy, simple below, densely pinnately branched above, branches widely spreading, complanate. Lower stem leaves small, scalelike, closely appressed, upper leaves widely spreading, oblong-ovate, short-acuminate, strongly auriculate at base, broadly inflexed on one or both sides below; margins erect, minutely denticulate; costa slender, ending near midleaf; cells linear, smooth, slightly vermicular, 3 to 4 µ wide, 35 to 50 µ long, shorter and colored across insertion. Branch leaves similar but slightly smaller. Sporophyte unknown.

LUZON, Rizal Province, San Isidro, *Ramos 19440* (type); Nueva Vizcaya Province, vicinity of Dupax, *McGregor 14942*.

Endemic.

On trees and stones. Quite distinct from *C. Urvilleanum* in the smaller size and smooth, sharply acuminate leaves.

4. **CALYPTOTHECIUM CAUDATUM** Bartram sp. nov. Plate 75, fig. 295.

Caules secundarii ad 8 cm longi, laxe pinnati, valde complanati, saepe longe attenuati. Folia fortiter complanata, horride patula, leniter undulata, e basi cordata, valde auriculata, oblongo-lanceolata, breviter acuminata, concava, superne minutissime denticulata; costa tenuis, supra medium folii producta; cellulae lineares, haud incrassatae, infimae laxiores. Caetera ignota.

Secondary stems strongly flattened, to 8 cm long, laxly pinnate, often attenuate in a long, caudate, microphyllous tip which is radiculose at the end, branches short and blunt. Leaves strongly complanate, widely spreading, lightly undulate, oblong-lanceolate from a cordate, auriculate base, concave, short-acuminate; margins erect, minutely denticulate near apex; costa slender, ending about ⅔ up the leaf; cells linear, 6 µ wide and 8 to 10 times as long, laxer and more porose near the insertion.

LUZON, Nueva Ecija Province, Bongabong, *Santos 172a*. MINDORO, Puerto Galera, *Bartlett 13880* (type).

Endemic.

On tree trunks. Widely distinct from any of the forms of *C. Urvilleanum* in the strongly flattened stems and branches and the acuminate leaves. The flagelliform tips of the stem frequently produce new plants from the radiculose ends. *C.*

Ramosi is a smaller plant with more tumid stems and branches and smooth leaves.

7. CALYPTOTHECIUM HIMANTOCLADIOIDES Bartram sp. nov. Plate 18, fig. 224.

Caules secundarii ad 8 cm longi, irregulariter pinnati, parce, complanati. Folia conferta, patentia, undulata, e basi grosse auriculata late lingulata, superne serrata, apice rotundato-obtusa; costa valida, infra apicem evanida; cellulae ovali-rhomboideae, incrassatae, basilares lineares, porosae. Caetera ignota.

Secondary stems up to 8 cm long, irregularly pinnate, yellowish green at tips, brown or black below, very glossy, slightly flattened. Leaves crowded, widely spreading, up to 2 mm long and 1 mm wide, broadly lingulate from a wide asymmetrical base, strongly auriculate, auricles large, coarsely toothed, inflexed, apex broadly rounded, with a short, obtuse point; margins strongly serrate in upper half, serrulate below; costa stout, ending a short distance below apex; cells oval-rhomboidal, incrassate, 5 to 7 μ wide and 2 to 4 times as long, shorter near apex and linear and porose toward base. Sporophyte unknown.

LUZON, Zambales Province, Mount Marayep, *Ramos & Edaño 44815.*

Endemic.

A very unique species with much the aspect of *Himantocladium* but apparently belonging here through the auriculate leaf base. The short, rhomboidal areolation, stout and relatively long costa, and rounded leaf apices, are all anomalous characters in *Calyptothecium.*

104. Genus NECKEROPSIS Reichd't.

Neckeropsis REICHD'T., Novara Exped. Bot. 1 (1870) 191.

Slender or robust, glossy plants with long, sparingly branched, very flat secondary stems. Leaves in 4 rows, horizontally spreading, usually undulate, broadly rounded or truncate at apex; costa single to about midleaf or double and short; cells smooth, short-rhomboidal above, more elongate below. Perichætium large, capsule immersed, peristome double, calyptra small, more or less pilose.

Key to the species of Neckeropsis.

1. Costa double, very short .... 1. *N. Lepineana.*
Costa single, to about midleaf .... 2.
2. Dioicous .... 2. *N. gracilenta.*
Autoicous .... 3. *N. crinita.*

1. **NECKEROPSIS LEPINEANA** (Mont.) Fleisch. Plate 18, fig. 287.

Neckeropsis Lepineana (Mont.) FLEISCH., Laubm. Java 3 (1907) 879.
Neckera Lepineana MONT., Ann. Sci. Nat. 107: Syll. (1848) 73.

Dioicous; robust plants, yellowish green, glossy, in pendulous masses. Secondary stems up to 30 cm long, very flat, irregularly branched, to 6 mm wide with leaves. Leaves horizontally spreading, strongly undulate, broadly lingulate from a clasping, decurrent base, inflexed on one side below, broadly rounded or nearly truncate at apex, minutely crenulate above; costa very short and faint, with unequal forks; cells rhomboidal, with firm, irregularly thickened walls, 5 to 6 µ wide and 3 to 6 times as long, shorter at apex, more elongate and porose below. Sporophyte on a short, lateral branch; capsule immersed on a very short seta; peristome teeth papillose, segments of endostome narrow from a low basal membrane.

Numerous collections from Luzon, Biliran, Negros, Panay, and Mindanao. Frequent throughout the Archipelago.

Distribution: East Africa, Malaysia, Pacific islands to Hawaii.

On trees and banks. More robust than either of the allied species and known at once by the very short, forked costa.

2. **NECKEROPSIS GRACILENTA** (Lac.) Fleisch. Plate 18, fig. 291.

Neckeropsis gracilenta (Lac.) FLEISCH., Laubm. Java 3 (1907) 876.
Neckera gracilenta LAC., Bryol. Jav. 2 (1863) 62.

Dioicous; slender, yellowish plants. Secondary stems pendulous, to 20 or 30 cm long, rather closely branched, branches often attenuate at tips, up to 2.5 mm wide with leaves, frequently with small clusters of short, microphyllous branchlets. Leaves to 1.8 mm long, lingulate, strongly undulate, broadly rounded at apex, minutely crenulate above; costa single, slender, extending about ¾ up the leaf; cells irregularly rhomboidal, shorter above and elongate below. Sporophyte not seen.

LUZON, Rizal Province, Montalban, *Bartlett 14503, 14506.* MINDORO, Puerto Galera, *Bartlett 13554.* POLILLO, *McGregor 10510.* PANAY, Iloilo Province, *Robinson 18240.* MINDANAO, Cotabato Province, *Robinson 11662:* Agusan Province, *Weber 1322:* Lanao Province, Lake Lanao, Camp Keithley, *M. S. Clemens "N."* JOLO, Bud Sungal, *Bartlett 16074.*

Distribution: Sumatra, Java, Celebes, Borneo, New Guinea, Samoa.

On branches and twigs of trees. In many respects this species is a small edition of *N. Lepineana*, but thoroughly distinct in the single-nerved leaves. No fruiting plants have been seen as far as I know.

3. NECKEROPSIS CRINITA (Griff.) Fleisch. Plate 16, fig. 204.

Neckeropsis crinita (Griff.) FLEISCH., Laubmfl. Java 3 (1907) 878.
Neckera crinita GRIFF., Not. 404; Ic. Pl. Asiat. 2 (1849) pl. 84.

Autoicous, rarely synoicous. Rather small plants, pale yellowish green or brownish, slightly glossy. Secondary stems crowded, to 6 cm long, stiff and wiry, subpendulous, closely branched, 3 to 4 mm wide with leaves. Leaves horizontally spreading, 2 mm long, undulate, lingulate from a clasping base, often minutely auriculate on one side, broadly rounded and slightly apiculate at apex; costa single, slender, often forked near tip, extending about ⅔ up the leaf; cells opaque, oval-rhomboidal, 5 µ wide and 2 to 4 times as long, shorter near apex and more elongate below. Sporophyte similar to *N. Lepineana*.

LUZON, Bataan Province, Lamao River, *Williams 850;* Olongapo Naval Reservation, *Bartlett 14110:* Nueva Ecija Province, Cabanatuan, *McGregor 5284:* Zambales Province, Olongapo, *Ebalo 39;* Pamulubuan, *Bartlett 14221:* Rizal Province, Montalban, *Bartlett 14666.* MINDANAO, Agusan Province, *Weber 1290.*

Distribution: Himalayas, Tonkin, China.

On twigs of trees. Usually an abundant fruiter. Distinguished from *N. gracilenta* by the inflorescence and the shorter, less flexuose secondary stems.

105. Genus HIMANTOCLADIUM (Mitt.) Fleisch.

Himantocladium (Mitt.) FLEISCH., Laubmfl. Java 3 (1907) 883.
Neckera § *Himantocladium* MITT., Journ. Linn. Soc. Bot. 10 (1868) 169.

Rather robust, glossy plants. Secondary stems pinnately branched, branches lax, or dense in a frondose head. Leaves in 8 rows, usually undulate, inflexed on one side at base, lingulate, bluntly rounded above, often apiculate; costa single, ending some distance below apex; cells irregularly rhomboidal, smooth. Perichætium small; capsule exserted on a short seta; peristome teeth papillose; calyptra small, sparingly pilose.

Key to the species of Himantocladium.

1. Plumose plants, leaves dull, not transversely undulate........ 1. *H. plumula.*
Irregularly branched plants, leaves glossy, transversely undulate........ 2.
2. Leaf apex truncate, cells opaque .... 4. *H. acrobiculatum.*
Leaf apex rounded, cells pellucid.. 3.
3. Very glossy, branches strongly flattened, leaves all laterally spreading.
3. *H. loriforme.*
Less glossy, branches more or less complanate, leaves in dorsal and ventral rows .... 2. *H. cyclophyllum.*

1. **HIMANTOCLADIUM PLUMULA** (Nees) Fleisch. Plate 18, fig. 390.

Himantocladium plumula (Nees) Fleisch., Laubmfl. Java 3 (1907) 889.

Pilotrichum plumula Nees in Brid. Bryol. Univ. 2 (1827) 759.

Synoicous; yellowish-green plants without lustre. Secondary stems erect, 4 to 6 cm long, densely branched above in a plumose frond. Stipe leaves appressed, scalelike; frond leaves crowded, slightly complanate, rugose but not transversely undulate, up to 2 mm long, lingulate, apex rounded, abruptly acute, broadly inflexed on one side below, minutely serrulate toward apex; costa stout, ending a short distance below apex, often forked at tip; cells irregularly rounded-hexagonal, with firm, pale walls, gradually becoming narrowly rectangular toward base. Perichætial leaves small; seta 1.5 mm long, slightly curved; capsule erect, exserted, ovoid-cylindric, urn 1.5 mm long; peristome teeth papillose, segments of endostome more or less split along the keel.

MINDORO, Puerto Galera, *Bartlett 13619* in part, *13847* in part. MINDANAO, Sax River, *Williams 2380.*

Distribution: Sumatra, Java, Borneo, New Caledonia.

On trees. Very distinct in the frondose habit and the dull, rugose leaves.

2. **HIMANTOCLADIUM CYCLOPHYLLUM** (C. M.) Fleisch. Plate 18, fig. 391.

Himantocladium cyclophyllum (C. M.) Fleisch., Laubmfl. Java 3 (1907) 887.

Neckera cyclophylla C. M., Syn. 2 (1851) 664.

? *Neckera Warburgii* Broth., Monsunia 1 (1900) 40.

Dioicous; rather robust plants, yellowish green, slightly glossy. Secondary stems ascending, to 10 cm long, irregularly pinnate, more or less flattened, branches often ending in flagelliform tips. Leaves complanate, usually showing distinct dorsal and ventral rows, erect-spreading, transversely undulate, up to 2.5 mm long, rather narrowly lingulate from a broadly ovate base, rounded at apex and short-pointed, irregularly serrate above, denticulate below; costa stout, ending some distance below apex; cells oval-rhomboidal, with firm walls, 5 to 7 µ wide and 2 to 5 times as long, shorter near apex and more elongate below. Perichætial leaves less than 1 mm long, with spreading, acuminate tips; seta 1.5 to 2 mm long, slightly curved, smooth; capsule exserted, cylindric, erect, urn 1.5 mm long; peristome teeth narrow, minutely papillose, segments of endostome from a low basal membrane.

LUZON, Rizal Province, San Andalis, *Reillo 19317*, in fruit; Montalban, *Bartlett 14380, 14510* in part: Benguet Subprovince, *Fenix 12945:* Apayao Subprovince, *Fenix 28336* in part: Pangasinan Province, Labrador, Mount San Isidro, *Fenix 30141:* Nueva Ecija Province, Bongabong, *Santos 172, 182:* Laguna Province, Mount Maquiling, *Baker 7012, Bartlett 15723, 15791, 15811;* Caluan, *McGregor 12511:* Tayabas Province, Baler, *Santos 359.* MINDORO, Puerto Galera, *Bartlett 13618* in part, *13690.* NEGROS, Oriental Negros Province, Dumaguete, *Chapman 26.* BILIRAN, *McGregor 18465.* POLILLO, *McGregor 10507.* MINDANAO, Agusan Province, *Weber 1209, 1324:* Davao Province, *Weber 1476:* Lanao Province, Pugaan Hill, *Bartlett 15874, 15921;* Palao Amopo, *Bartlett 15966, 15972.* BASILAN, *Reillo 16278.*

Distribution: Java, Celebes, Borneo, New Guinea, Tahiti.

On trees and rocks. I have not seen the type of *N. Warburgii* Broth., but there is nothing noteworthy in the description except possibly the narrower leaves. It will probably prove to be a form of *H. cyclophyllum.*

4. **HIMANTOCLADIUM LORIFORME** (Bryol. Jav.) Fleisch. Plate 18, fig. 362.

Himantocladium loriforme (Bryol. Jav.) FLEISCH., Laubmfl. Java 3 (1907) 881.

Neckera loriforme Bryol. Jav., Bryol. Jav. 2 (1863) 63.

Resembling *H. cyclophyllum* but usually more laxly branched and more glossy. Secondary stems very flat, with the leaves all laterally spreading without any dorsal or ventral rows. Leaves more broadly lingulate from a scarcely wider base.

BATAN, Mount Iraya, *Bartlett 15469.* LUZON, Benguet Subprovince, *Mearns 2856,* Itogon near Baguio, *Williams 1688;* Sablang, *Fenix 12811:* Apayao Subprovince, *Fenix 28336* in part. MINDORO, Puerto Galera, *Bartlett 13637.* POLILLO, *Robinson 6948.* BILIRAN, *McGregor 18470.* PALAWAN, Mount Mantalingahan, *Edaño 8084.*

Distribution: Java, Celebes, Borneo, New Guinea, Fiji, Samoa.

This species is uncomfortably close to *H. cyclophyllum* which occasionally shows some of the branches just as complanate as they are in *H. loriforme*. I can find no consistent distinctions in the leaf cells or in the dentation of the apex, and I doubt if the difference in the leaf outline is consistent enough to be reliable.

4. **HIMANTOCLADIUM SCROBICULATUM** (Nees) Bartram comb. nov. Plate 19, fig. 303.

Neckera scrobiculata NEES, Nov. Act. Akad. Caes. Leop. 16 Suppl. 2 (1843) 477.

Slender, pale-green, slightly glossy plants. Secondary stems to 6 cm long, flexuose, irregularly pinnate, more or less flattened, branches frequently flagelliform and radiculose at tips. Leaves crowded, in 8 rows, slightly complanate, transversely undulate, up to 2 mm long and 1 mm wide, lingulate, broadly truncate at apex, erose-denticulate across apex with minute teeth often in pairs, denticulate below; costa rather stout, ending some distance below apex, often forked at tip; cells oval-rhomboidal, more or less opaque, 4 to 6 µ wide and 2 to 3 times as long, narrowly rhomboidal or linear and pellucid at extreme base. Sporophyte not seen.

LUZON, Bataan Province, Lamao River, *Williams 849*: Zambales Province, Kabalan, Mount Olongapo, *Ebalo 35*.

Endemic.

On rocks. I have not seen the original plant collected by Meyen, and refer the above collections here with considerable hesitation, particularly as the plants are uniformly sterile. The stems are not as flat as in *H. loriforme*, and the leaves are different in shape and more abruptly truncate and more finely toothed at the apex. Moreover, the cells are smaller and not nearly so pellucid. As far as these collections are concerned, the species appears to be more naturally allied to *Himantocladium* than to *Neckeropsis*.

106. Genus HOMALIODENDRON Fleisch.

Homaliodendron FLEISCH., Hedwigia 45 (1906) 72.

Dioicous; usually robust, glossy plants with a frondose habit. Secondary stems bipinnate or tripinnate from a woody stipe, rarely slender and sparingly branched, branches strongly flattened. Frond leaves spreading, not undulate, lingulate and coarsely incised-toothed above, seldom rounded-spathulate and subentire; costa single, faint, ending near midleaf; cells rhomboidal, smooth, more elongate below. Capsule ovoid-cylindric, exserted on a short seta; peristome double, teeth transversely striolate below, segments of endostome from a low basal membrane; calyptra small, more or less pilose.

Key to the species of Homaliodendron.

1. Robust plants, leaves coarsely incised-toothed............ 3. *H. flabellatum.*
   Smaller plants, leaves minutely toothed.. 2.
2. Branches few, distant, flagellate at tips.............................. 1. *H. exiguum.*
   Branches numerous, dense, not flagelliform............ 2. *H. microdendron.*

1. **HOMALIODENDRON EXIGUUM** (Bryol. Jav.) Fleisch. Plate 18, fig. 10.

Homaliodendron exiguum (Bryol. Jav.) FLEISCH., Laubmfl. Java 3 (1907) 897.
? *Neckera Semperiana* HAMPE mss. C. M. in Bot. Zeit. (1862) 381.
Homalia exigua Bryol. Jav., Bryol. Jav. 2 (1863) 55.

Slender, pale-green, slightly glossy plants growing in small, lax tufts. Secondary stems wiry, to 5 cm long, sparingly branched, branches complanate, frequently flagelliform at tips. Basal leaves minute, appressed, upper leaves widely spreading, complanate, 1 to 1.5 mm long and up to 0.7 mm wide, broadly spathulate, rounded above and crenulate across apex, lightly inflexed below on narrow side; costa ending near midleaf; cells oval-rhomboidal, smooth, incrassate, gradually longer and linear-rhomboidal at base. Branch leaves smaller and more rounded. Sporophyte unknown.

BATAN, Mount Iraya, *Bartlett 15475.* LUZON, Benguet Subprovince, Mount Santo Tomas, *Clemens 51825a;* Baguio, *Elmer 8892* in part. MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15017.*

Distribution: Himalayas, Ceylon, Malay Peninsula, Sumatra, Java, Celebes, Australia, New Guinea.

On trees; often in small tufts on twigs with other mosses. Occasional plants with exactly the habit of *H. exiguum* are found mixed with the tufts of *H. microdendron,* and it is possible that the slender, sparingly branched habit represents the form found in small tufts on twigs, while the typical frondose form of *H. microdendron* is the result of a more congenial habitat.

The description of *N. Semperiana* suggests nothing radically different from *H. exiguum.* I have not seen the original, but if it proves to be identical the name will have priority as it antidates the publication of *Homalia exigua* Bryol. Jav. by a year. On the other hand, *N. Semperiana* may belong in *Himantocladium* as Fleischer suggests.

2. **HOMALIODENDRON MICRODENDRON** (Mont.) Fleisch. Plate 14, fig. 195.

Homaliodendron microdendron (Mont.) FLEISCH., Hedwigia 45 (1905–1906) 78.

Hookeria ? microdendron MONT., Voy. Bonite Crypt. (1846) 160.

? *Hypnum spathulaefolium* C. M., Syn. 2 (1851) 231.

Medium-sized, laxly tufted, frondose plants from a stipelike base. Secondary stems erect, 2 to 7 cm high, bipinnate and tripinnate above in a rather compact frondose head, stems and branches very flat, blunt, rarely flagelliform. Stipe leaves small, appressed; frond leaves up to 2 mm long and 1 mm wide, broadly spathulate, rounded and crenulate at apex, inflexed on one side below; costa ending a little above midleaf; cells as in *H. exiguum*. Branch leaves smaller, rounded spathulate; costa variable, often short and faint. Sporophyte unknown.

LUZON, Bataan Province, Mount Mariveles, *Leiberg 1217a*: Benguet Subprovince, Mount Santo Tomas, *Hadden 135*; Mount Data, *Hadden 135a*; Baguio, *Williams 1670*. MINDORO, Puerto Galera, *Bartlett 13685, 13877, 13881*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 86*. MINDANAO, Bukidnon Province, Tangculan, *Ramos & Edaño 87174* in part.

Distribution: Sikkim, Khasia, Bhotan, Yunnan, Borneo, Formosa.

On trees and banks in damp forests. When developed in the typical frondose form this species is very distinct from *H. exiguum* in habit, but the structural details are nearly identical in both species.

As far as the Philippine plants are concerned, I think *H. spathulaefolium* C. M. can safely be included here. Strongly nerved and faintly nerved leaves are found side by side on the same branch, so this distinction has no value.

No. 1670 from Baguio has been determined as *Neckeropsis nitidula* (Mitt.) which, as I understand this species from a Tonkin specimen named by Theriot, is very different, with elongated, little-branched stems, and leaves strongly nerved nearly to the short-pointed apex. As far as I know *N. nitidula* has never been collected in the Philippines.

3. **HOMALIODENDRON FLABELLATUM** (Smith) Fleisch. Plate 15, fig. 356.

Homaliodendron flabellatum (Smith) FLEISCH., Hedwigia 45 (1905–1906) 74.

Hookeria flabellata SMITH, Trans. Linn. Soc. 9 (1808) 280.

Large, robust, glossy plants growing in lax tufts on trunks of trees. Secondary stems horizontal, copiously bipinnate and tripinnate in a frond of variable outline, up to 10 cm long or longer but usually shorter. Stipe leaves small, closely appressed, gradually merging with the spreading, strongly flattened, polymorphous frond leaves which are crowded, lingulate, up to 3 mm long, broadly rounded and coarsely toothed at apex; costa slender, ending near midleaf; cells oval-rhomboidal, smooth, incrassate, gradually becoming linear and porose toward base. Leaves of ultimate branches smaller and coarsely incised above middle. Seta 1.5 mm long; capsule exserted, erect or slightly curved, ovoid, urn 2 mm long; lid conic-rostrate, curved, 1 mm long; calyptra densely pilose.

Numerous collections from Luzon, Biliran, Palawan, Negros, and Mindanao.

Distribution: Wide; India and Ceylon to Malaysia and Japan, and through the Pacific islands to Hawaii.

On trees and rocks; frequently but seldom fruiting. A conspicuous, handsome moss which is likely to be found in damp forests everywhere. The flat fronds and coarsely incised leaves are salient characters. There is no uniformity in the outline of the fronds, and I am extremely doubtful if *H. scalpellifolium* (Mitt.), *H. ligulaefolium* (Mitt.), and a number of other closely allied species can be segregated with any satisfaction.

107. Genus PINNATELLA (C. M.) Fleisch.

Pinnatella (C. M.) FLEISCH., Hedwigia 45 (1906) 79.
Hypnum § *Pinnatella* C. M., Linnæa 39 (1875) 456.

Small or robust, dull yellowish-green plants growing in lax tufts. Primary stems creeping, secondary stems scattered, erect, bipinnately branched in a frondose head from a short, simple, woody base, not or slightly flattened. Leaves spreading, concave, smooth, rarely undulate, usually with a distinct longitudinal plica on each side of costa, ovate, short-pointed, minutely toothed above; costa stout, ending near apex; cells rounded-hexagonal, often with a small papilla over lumen, linear below. Perichætium small; seta short, papillose; capsule exserted, ovoid; peristome double. Dioicous.

Key to the species of Pinnatella.

1. Stems with paraphyllia, leaves undulate .... 2.
Stems without paraphyllia, leaves smooth .... 3.
2. Leaves acutely pointed, costa faint .... 1. *P. anacamptolepis.*
Leaves rounded, costa stout .... 2. *P. microptera.*

3. Small, densely frondose plants.. 4.
Robust, laxly pinnate plants.. 6.
4. Leaves acute, plants up to 3 to 4 cm high........................ 3. *P. ambigua.*
Leaves broadly rounded, plants less than 2 cm high............ 4. *P. nana.*
6. Leaves with an intramarginal border of elongate cells.
5. *P. alopecuroides.*
Leaves without an intramarginal border........................ 6. *P. luzonensis.*

1. PINNATELLA ANACAMPTOLEPIS (C. M.) Broth. Plate 18, fig. 307.

Pinnatella anacamptolepis (C. M.) Broth., E. & P. Pflanzenfam. ed. 1 Musci (1906) 857.
Neckera anacamptolepis C. M., Syn. 2 (1851) 663.

Small, pallid-green, frondose plants, slightly glossy. Secondary stems to 2.5 cm long, densely bipinnate from a slender, woody stipe, with scattered lanceolate paraphyllia on the stems and branches. Stipe leaves small, squarrose-recurved; stem leaves asymmetrical, broadly ovate, acute or short acuminate, minutely denticulate above, transversely undulate, to 1.5 mm long; costa variable, single to about midleaf or double and shorter with unequal forks. Branch leaves much smaller, concave, from a narrow, clasping base, less strongly undulate; cells oval-rhomboidal, smooth, incrassate, linear and slightly porose at base; costa faint, single to about midleaf or double and shorter. Sporophyte unknown.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 20301a.*

Distribution: Ceylon, Sumatra, Java.

On twigs of trees with *Chaetomitriopsis glaucocarpa.* These plants are not as well developed as those in Fleischer's *No. 474* from Java, but agree in all the essential features. The pointed leaves and weak, variable costa will readily separate it from *P. microptera.*

2. PINNATELLA MICROPTERA (C. M.) Fleisch. Plate 18, fig. 308.

Pinnatella microptera (C. M.) Fleisch., Laubmfl. Java 3 (1908) 915.
Homalia microptera C. M., in herb.

Small, dull-green plants. Secondary stems rigid, 1 to 1.5 cm high, pinnate from near base, with narrowly lanceolate paraphyllia in leaf axils, branches usually ending in elongate, microphyllous tips which soon become naked. Leaves complanate, concave, slightly undulate; stem leaves about 1 mm long, oblong-ovate, rounded at apex, entire; branch leaves smaller, broadly ovate; costa stout, ending some distance below apex; cells rounded-hexagonal, slightly elongate on one side near costa at extreme base. Sporophyte unknown.

LUZON, Laguna Province, Mount Maquiling, *Bartlett 15691, 15692, 15693, 15694, 15695, 15696;* Cagayan Province, Magapit, *Bartlett 14857.*

Distribution: Singapore.

These recent collections are the only ones I have seen, but Fleischer credits the species to the Philippines on the basis of a collection by Micholitz. It is a curious little plant with broadly rounded, undulate leaves, and nearly always shows the characteristic naked branch tips.

3. PINNATELLA AMBIGUA (Bryol. Jav.) Fleisch. Plate 15, fig. 309.

Pinnatella ambigua (Bryol. Jav.) FLEISCH., Hedwigia 45 (1906) 81.
Thamnium ambiguum Bryol. Jav., Bryol. Jav. 2 (1863) 72.

Slender, laxly tufted, frondose plants, dull yellowish green. Secondary stems to 4 cm high, erect, densely bipinnate above in a compact frond, simple and woody below. Stipe leaves small, distant, widely spreading; frond leaves much larger, 1.5 to 2 mm long on the main stem, oblong-ovate, acute, distantly denticulate toward apex, lightly plicate when dry; costa stout, ending near apex; cells rounded-hexagonal, thin-walled, smooth, smaller at margins, gradually becoming rectangular toward base, 3 to 4 rows at basal margins small, rounded, colorless. Leaves of ultimate branches 0.5 mm long, ovate, concave. Perichætial leaves abruptly narrowed to linear, spreading points; seta 3 mm long, slightly curved, yellow, papillose above, smooth below; capsule erect, ovoid, urn 2 mm long, exothecial cells hexagonal, small. Peristome, lid, and calyptra not seen.

LUZON, Rizal Province, Montalban, *Bartlett 14502.* PALAWAN, Mount Balagbag, *Edaño 80901* in fruit; Mount Mantalingahan, *Edaño 80850.* NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 24, 27.* MINDANAO, Bukidnon Province, Tangculan, *Ramos & Edaño 37180a;* Lanao Province, Pugaan Hill, *Bartlett 16875, 15878b, 15832, 15917, 15956.*

Distribution: Bhotan, Burma, Sumatra, Java.

On tree trunks. A handsome little plant, usually compactly branched in a dense, trim frond but occasionally with irregular frondose innovations.

4. PINNATELLA NANA (Williams) Bartram comb. nov. Plate 16, fig. 310.

Himantocladium nanum WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 359.

Minute, delicate plants, dull yellowish green. Secondary stems erect, 8 to 20 mm long, pinnate or bipinnate above, simple below. Stipe leaves minute, distant, spreading; upper stem leaves slightly complanate, oblong-ovate, concave, to 0.8 mm long, broadly rounded and often minutely mucronate, distantly and minutely denticulate in upper half; costa stout, ending near apex; cells rounded-hexagonal, slightly incrassate, 6 to 10 μ in diameter, more elongate and rectangular near base, smaller and subquadrate at margins. Sporophyte unknown.

NEGROS, Oriental Negros Province, Dumaguete, *Chapman 54*. MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 3150* (type): Bukidnon Province, Tangculan, *Fenix 26199a*.

Endemic.

On trees. Differs from *P. ambigua* not only in size but also in the uniformly rounded leaf apices.

5. PINNATELLA ALOPECUROIDES (Hook.) Fleisch. Plate 19, fig. 311.

Pinnatella alopecuroides (Hook.) FLEISCH., Hedwigia 45 (1906) 84.
Hypnum alopecuroides HOOK., Lond. Journ. Bot. (1840) 20.

Robust, dull, yellowish-brown plants. Secondary stems pendulous, to 10 cm long or longer, laxly and irregularly pinnate. Leaves laxly erect, with incurved points when dry, widely spreading when moist, strongly biplicate, especially when dry, ovate-lanceolate from a broad base, acute, denticulate toward apex; costa stout, ending just below apex; cells rounded, incrassate, smooth, with a conspicuous intramarginal border of linear, thick-walled cells on both sides of leaf extending from insertion at least ¼ of way up the leaf, rectangular across insertion; stem leaves 2 to 2.5 mm long, branch leaves smaller. Sporophyte unknown.

LUZON, Benguet Subprovince, Baguio, *Merrill 7852*: Rizal Province, Montalban, *Bartlett 14387, 14402, 14411, 14418, 14507, 14515, 14528, 14532, 14573*.

Distribution: Nepal, Bhotan, Sikkim, Burma, Ceylon, Sumbawa.

On limestone cliffs. Sharply distinct from the other local species in the conspicuous leaf border.

6. PINNATELLA LUZONENSIS Broth. Plate 19, fig. 312.

Pinnatella luzonensis BROTH., Philip. Journ. Sci. 8 (1913) 81.

Robust plants with the habit of *P. alopecuroides*. Leaves narrowly ovate-lanceolate, short-acuminate, denticulate in upper half, without an intramarginal border; costa ending in acumen near apex; cells broadly oval, very incrassate, porose, 7 to 8 μ wide, 12 to 26 μ long, smaller at margins, basal cells similar but more rectangular, 2 to 3 marginal rows much smaller and subquadrate. Sporophyte unknown.

LUZON, Benguet Subprovince, Baguio, *Merrill 7880.*

Endemic.

On limestone cliffs. Comparable only with *P. alopecuroides* but widely different in the unbordered, narrower, and more sharply pointed leaves with much larger cells.

108. Genus THAMNIUM Bry. Eur.

Thamnium Bry. Eur. 5 fasc. 49/51 Mon. (1852).

Robust plants, often dendroid in habit. Primary stems rhizomatous; secondary stems suberect, irregularly branched above, often stoloniferous at base, slightly or strongly flattened. Leaves ovate, short-pointed, usually strongly toothed above; costa stout, ending near apex; cells oval-rhomboidal, smooth. Perichætium small; seta smooth, elongate, more or less flexuose; capsule ovoid, suberect; peristome double, hypnoid in structure; calyptra cucullate.

Key to the species of Thamnium.

1. Slender plants, leaves minutely denticulate.. 2.
   Robust plants, leaves coarsely toothed.. 3.
2. Marginal leaf cells bistratose, forming a narrow border.. 2. *T. negrosense.*
   Leaf cells in one layer throughout.. 1. *T. ellipticum.*
3. Dioicous, stems and branches flat.. 3. *T. latifolium.*
   Autoicous, stems and branches not or scarcely flattened.
   4. *T. subseriatum.*

1. THAMNIUM ELLIPTICUM (Bryol. Jav.) Kindb. Plate 19, fig. 313.

Thamnium ellipticum (Bryol. Jav.) KINDB., Hedwigia 41 (1902) 209.
Porotrichum ellipticum Bryol. Jav., Bryol. Jav. 2 (1863) 70.

Dioicous; slender, dull-green plants, laxly tufted. Secondary stems 4 to 6 cm long, laxly erect, distantly and irregularly branched, branches strongly flattened, often flagelliform-attenuate at tips, 2 to 2.5 mm wide with leaves. Lower leaves small, erect-spreading, quickly becoming larger and complanate above, upper leaves erect-spreading, very complanate, 1 to 1.5 mm long, oblong-ovate, abruptly rounded to a short, acute point, more or less asymmetrical at base, minutely serrulate toward apex, entire below; costa stout, ending just below apex; cells irregularly hexagonal, smooth, narrowly rectangulate toward base. Seta about 1.5 cm long, smooth, flexuose; capsule ovoid, nodding.

LUZON, Rizal Province, Hinulugan Taktak (waterfall), *Bartlett 15247, 15252, 15261;* Benguet Subprovince, Baguio, *Elmer 8857;* Tayabas Province, Infanta, *Robinson 9322;* Baler, *Santos 546;* Laguna Province, Mount Maquiling, *Robinson 17215.*

Distribution: Sumatra, Java, Borneo.

On wet rocks. Well characterized by the lax habit and flattened stems.

7. **THAMNIUM NEGROSENSE** Bartram sp. nov. Plate 19, fig. 314.

Species precedenti habitu valde similis sed foliis e basi fere ad apicem incrassato-limbatus.

Slender plants resembling *T. ellipticum* in habit and color. Secondary stems to 10 cm high, ultimate branches usually ending in long, flexuose, flagelliform, microphyllous tips. Leaves similar in size and outline to *T. ellipticum* but distinctly bordered from insertion nearly to apex with 2 to 4 rows of more incrassate, slightly elongate cells in two layers. Sporophyte unknown.

NEGROS, Oriental Negros Province, Cuernos mountains, Dumaguete, *Elmer 9930.*

Endemic.

In all the plants I have examined the thickened leaf border is consistently present and noticeable even with a hand lens.

8. **THAMNIUM LATIFOLIUM** (Bryol. Jav.) Par. Plate 19, fig. 315.

Thamnium latifolium (Bryol. Jav.) PAR., Ind. Bryol. (1894) 1271.
Porotrichum latifolium Bryol. Jav., Bryol. Jav. 2 (1863) 60.

Dioicous; robust plants, dendroid in habit, dull green. Secondary stems erect, 6 to 8 cm high, simple and woody below, irregularly bipinnate above, branches flat, widely spreading, tapering at tips. Stipe leaves small, distant, laxly spreading, gradually larger upward; stem leaves erect-spreading, biplicate when dry, broadly ovate, abruptly contracted to a short, acute point, up to 2.8 mm long and 1.5 mm wide, broadly inflexed on one side below, coarsely and irregularly serrate toward apex; costa stout, smooth, ending just below apex; cells oval-hexagonal, smooth, in oblique rows above, gradually becoming linear toward base. Branch leaves smaller and more complanate. Sporophyte not seen.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13308.*

Distribution: Sumatra, Java, New Zealand, Japan.

On dead wood. This fine moss is an interesting addition to the Philippine flora.

4. THAMNIUM SUBSERIATUM (Hook.) Mitt. Plate 19, fig. 314.

Thamnium subseriatum (Hook.) MITT., Journ. Linn. Soc. 8 (1865) 165.

Neckera subseriata HOOK., Lond. Journ. Bot. (1840) 13.

Autoicous; robust, dendroid plants, dull yellowish green. Secondary stems erect, 4 to 6 cm high, irregularly pinnate and bipinnate above from a simple woody stipe, branches tumid, not flattened, blunt at tips. Stipe leaves small, scattered; stem and branch leaves erect-spreading on all sides, lightly biplicate when dry, ovate, short-acuminate, 2 to 2.3 mm long and 1 to 1.2 mm wide, irregularly serrate toward apex, serrulate below; costa stout, ending just below apex; cells smooth, irregularly oval-hexagonal, with firm, pale walls, gradually becoming narrowly rhomboidal and linear toward base. Seta 15 to 17 mm long, smooth, flexuose; capsule nodding or horizontal, ovoid, urn 2 mm long; peristome large.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1721*.

Distribution: Himalayas, Ceylon.

Very distinct from the other local species in the tumid, blunt branches and the autoicous inflorescence.

29. Family LEMBOPHYLLACEÆ

Usually robust, glossy plants. Secondary stems dendroid or elongate and procumbent. Leave ovate, short-pointed, deeply concave, toothed above; costa double and short or single to near midleaf; cells linear, incrassate, usually with a distinct alar group. Seta slender, elongate, smooth; capsule inclined or horizontal; peristome double, teeth striolate; calyptra cucullate, naked.

Key to the genera of Lembophyllaceæ.

Stems procumbent, costa double and short.......................... 109. *Elmeriobryum*.
Stems erect, dendroid, costa single to midleaf.......... 110. *Porotrichodendron*.

109. Genus ELMERIOBRYUM Broth.

Elmeriobryum BROTH., Leafl. Philip. Bot. 6 (1913) 1974.

Rather robust, densely tufted plants, pale golden brown, glossy. Stems elongate, procumbent or ascending, irregularly pinnate and bipinnate, branches terete, densely foliate. Leaves closely imbricated, ovate, short-acuminate, deeply concave, minutely serrulate near apex; costa short and double; cells very long and narrow, smooth, alar group small. Seta elongate; capsule ovoid, inclined; lid convex, apiculate; peristome double.

ELMERIOBRYUM PHILIPPINENSE Broth. Plate 19, fig. 117.

Elmeriobryum philippinense BROTH., Leafl. Philip. Bot. 6 (1913) 1974.
Elmeriobryum assimile BROTH., Leafl. Philip. Bot. 6 (1913) 1976.
Elmeriobryum Brotheri WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 366.

Dioicous: pale yellowish-green or golden-brown glossy plants in dense mats or cushions. Stems procumbent, copiously branched, branches suberect, curved, irregularly pinnate, subterete. Leaves crowded, ovate-lanceolate, abruptly short-acuminate, deeply concave, lightly plicate, up to 1.6 mm long, minutely serrulate toward apex; costa short, double, very faint; cells long and narrow, 3 to 4 µ wide and 30 to 40 µ long, smooth, slightly wider and porose near insertion, subquadrate at basal angles in a variable, small and poorly defined alar group. Branch leaves smaller. Inner perichætial leaves up to 3 mm long, acuminate; seta 2.5 to 4.5 cm long, smooth, curved at tip; capsule horizontal, oblong, urn 2 mm long; peristome teeth striolate, segments of endostome narrow, from a high basal membrane, with 1 to 3 intermediate nodose cilia; lid convex, apiculate: spores papillose, 20 to 25 µ.

LUZON, Benguet Subprovince, Baguio, *Elmer 8374* (type), *8449*, *Williams 1725*, in fruit, *Robinson 11099*, *Fenix 12948*; Mount Santo Tomas, *Bartlett 13303*, *13274*, *Clemens 51908*; Mount Data, *Haddens*; between Baguio and Mount Santo Tomas, *Williams 1706*, in fruit; Pauai, *Copeland 1340*, *Merrill 7825*: Bontoc Subprovince, *Vanoverbergh 598*, *1918*: Ifugao Subprovince, Mount Polis, *McGregor 20309*.

Endemic.

On damp rocks and banks. In my judgment this is a monotypic genus. The distinctions between *E. assimile* and *E. philippinense*, based on color and alar cells, are too subtle and variable to be of any practical value. *E. Brotheri* is precisely the same form as *E. assimile*.

The leaves vary in shape from broadly ovate to ovate-lanceolate, and the alar cells, while always few, are more numerous and better defined in some leaves than in others, but these differences are inconstant and trivial.

110. Genus POROTRICHODENDRON Fleisch.

Porotrichodendron FLEISCH., Laubmfl. Java 3 (1908) 937.

Robust, glossy plants. Secondary stems dendroid, irregularly branched, more or less julaceous. Leaves ovate, deeply concave, short-pointed, denticulate above; costa single, slender, ending near midleaf; cells linear, smooth, alar group small and colored. Perichætium large; seta long, smooth; capsule inclined, ovoid; peristome double; lid with a long, oblique beak; annulus broad.

POROTRICHODENDRON MAHAHAICUM (C. M.) Fleisch. Plate 35, fig. 378.

Porotrichodendron mahahaicum (C. M.) FLEISCH., Laubmfl. Java 3 (1908) 937.

Hypnum mahahaicum C. M., Linnæa 38 (1874) 563.

Dioicous; golden-green, glossy plants. Primary stems creeping; secondary stems laxly ascending, dendroid, irregularly pinnate, to 15 cm long, branches widely spreading, more or less julaceous. Lower leaves scarious, laxly appressed; upper leaves oblong-ovate, abruptly acute, deeply concave, smooth; margins entire below, sharply serrulate near apex; costa slender, ending slightly above midleaf; cells linear, smooth, a small group at basal angles rounded and brownish. Perichætial leaves acuminate, inner up to 3 mm long; seta 3 to 4 cm long, flexuose; capsule ovoid, nodding or horizontal; peristome teeth transversely striolate, segments of endostome from a basal membrane about ½ height of teeth, with 1 or 2 rudimentary cilia; lid long-rostrate.

LUZON, Laguna Province, Majayjay, altitude 7,200 feet, *C. Wallis.*

Endemic.

It is curious that this large, conspicuous moss has never been recollected. It is evidently restricted to a very localized area. The only plants I have seen are from the original collection.

30. Family HOOKERIACEÆ

Small or medium-sized, often flaccid plants with branched, more or less flattened stems. Leaves variable in outline, often bordered; costa single or double, usually ending well below apex; cells smooth or papillose, often wide and lax, alar group not differentiated. Seta elongate, smooth or scabrous; capsule inclined or horizontal, rarely erect; peristome double, teeth often with a wide median furrow, papillose or striolate; calyptra mitriform, usually lobed or fringed at base, scabrous or pilose.

Key to the genera of Hookeriaceæ.

1. Costa single .... 2.
Costa double or none .... 4.

2. Stems scarcely flattened, leaves uniform........................ 111. *Daltonia*.
Stems very flat, leaves dimorphous.. 3.
3. Peristome teeth furrowed, transversely striolate.... 113. *Distichophyllum*.
Peristome teeth not furrowed, papillose........................ 112. *Leskeodon*.
4. Costæ very short and faint.. 5.
Costæ extending beyond midleaf.. 7.
5. Leaves bordered, seta prickly.. 114. *Eriopus*.
Leaves not bordered, seta smooth.. 6.
6. Lid conic, leaves deflexed.. 120. *Chaetomitriopsis*.
Lid rostrate, leaves erect-spreading........................ 119. *Chaetomitrium*.
7. Leaves bordered, cells very lax.. 115. *Cyclodictyon*.
Leaves not bordered, cells firm.. 8.
8. Peristome teeth papillose, not furrowed.................. 118. *Actinodontium*.
Peristome teeth striolate, deeply furrowed.. 9.
9. Leaf cells unipapillate and rounded, costæ strong...... 116. *Callicostella*.
Leaf cells smooth and elongate, costæ weak.................. 117. *Hookeriopsis*.

111. Genus DALTONIA Hooker and Taylor

Daltonia HOOKER & TAYLOR, Musc. Brit. (1818) 80.

Small or medium-sized, more or less glossy plants. Stems laxly erect, simple or forked, densely foliate, not or scarcely flattened. Leaves ovate or lanceolate, acuminate, subentire, bordered, carinate with a broad median fold above; costa single, ending some distance below apex; upper cells oval-rhomboidal, linear at margins in a distinct border. Setæ lateral, scabrous above; capsule suberect; peristome teeth papillose; calyptra deeply fringed at base.

Key to the species of Daltonia.

Leaves ovate-lanceolate, strongly contorted when dry, margins flat.
1. *D. contorta*.
Leaves linear-lanceolate, slightly flexuose when dry, margins revolute.
2. *D. angustifolia*.

1. DALTONIA CONTORTA C. M. Plate 19, fig. 319.

Daltonia contorta C. M., Syn. 2 (1851) 660.

Medium-sized brownish-green plants in dense tufts. Stems up to 1.5 cm high, simple or sparingly branched. Leaves crowded, erect and strongly contorted when dry, erect-spreading when moist, oblong-lanceolate, abruptly short-acuminate, entire, to 3 mm long, 0.8 mm wide; margins plane; costa strong, ending in upper fourth of leaf well below base of acumen; cells oval-rhomboidal, with firm, pale walls, rather opaque, more elongate below, with a distinct border of linear, pellucid cells all around, 12 to 16 rows wide at base, gradually narrowing upward. Setæ 6 to 8 mm long, scabrous nearly to base; capsule erect or slightly nodding, ovoid, urn 1 to 1.4 mm long; peristome teeth densely papillose, segments of endostome narrow from a low basal membrane; lid long-rostrate; calyptra deeply fringed.

LUZON, Benguet Subprovince, Baguio, *Williams 1666.*

Distribution: Ceylon, Java, Hawaii.

On trees. Sharply distinguished from *D. angustifolia* by the broader leaves with flat margins and a wide, distinct border.

1. **DALTONIA ANGUSTIFOLIA** Doz. and Molk. Plate 13, fig. 120.

Daltonia angustifolia Doz. & Molk., Musc. Frond. Archip. Ind. (1844) 5.

Autoicous and synoicous. Small yellowish-green plants in lax tufts or mingled with other mosses. Stem decumbent, 1 cm long or shorter. Leaves crowded, erect and slightly flexuose when dry, more rigid when moist, 2 to 2.6 mm long, less than 0.4 mm wide, linear-lanceolate, gradually acuminate; margins entire, rather strongly recurved on one or both sides; costa ending some distance below apex; upper cells narrowly rhomboidal, elongate and very lax toward base, border of elongate cells narrow and poorly defined, 3 to 4 rows wide below, ending near apex. Setæ slender, 6 to 10 mm long, slightly scabrous near tips; capsule nodding, urn 1 mm long; peristome and calyptra similar to *D. contorta.*

LUZON, Benguet Subprovince, Baguio, *Williams 1665.*

Distribution: Ceylon, Java, Borneo.

On trees. *D. angustifolia* is a variable species. Var. *revoluta* is well marked by the broad, lax upper leaf cells while var. *strictifolia* varies toward the other extreme.

DALTONIA ANGUSTIFOLIA Doz. and Molk. var. **STRICTIFOLIA** (Mitt.) Fleisch.

Daltonia angustifolia Doz. & Molk. var. *strictifolia* (Mitt.) FLEISCH., Laubmfl. Java 3 (1908) 959.

Daltonia strictifolia MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 146.

Upper cells narrower, practically linear; seta more scabrous above; capsule shorter.

NEGROS, Canlaon Volcano, *Merrill 6818.*

DALTONIA ANGUSTIFOLIA Doz. & Molk. var. **REVOLUTA** (Broth.) Bartram comb. nov.

Daltonia revoluta BROTH., Philip. Journ. Sci. § C 5 (1910) 156.

Upper leaf cells broad and lax, oval-hexagonal; margins revolute nearly to apex.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merritt, & Zschokke 16405.*

112. Genus LESKEODON Broth.

Leskeodon BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1907) 925.

Pale, flaccid plants growing in dense mats. Stems simple or forked, densely foliate, flat. Leaves dimorphous, dorsal and ventral rows smaller and erect, lateral rows spreading, spathulate, acuminate, entire, narrowly bordered; costa single, ending in or near apex; cells lax, hexagonal, smooth. Seta short, scabrous above; capsule erect; peristome teeth papillose, with a fine, zigzag median line; calyptra small, fringed at base.

LESKEODON PHILIPPINENSIS Broth. Plate 19, fig. 321.

Leskeodon philippinensis BROTH., Philip. Journ. Sci. § C 13 (1918) 213.

Synoicous; rather robust, dull, pale-green plants in dense, soft mats. Stems up to 2.5 cm long, slightly radiculose, densely foliate, strongly flattened, 5 to 6 mm wide with leaves. Lateral leaves ovate-spathulate, entire, to 4 mm long and 1.4 mm wide, acuminate at apex and prolonged in a semitwisted, hairlike point; costa slender, ending just below apex or confluent with point; upper cells nearly isodiametrical, hexagonal, 25 to 30 µ in diameter, smaller toward margins, laxer and subrectangular below, with a narrow, hyaline border of linear cells all around, 2 to 3 rows wide below. Perichaetial leaves small; seta 1.5 to 2 mm long, smooth below, scabrous above; capsule erect, ovoid, urn 0.8 mm long; peristome relatively large, teeth and segments papillose; lid conic-rostrate; calyptra deeply fringed.

BILIRAN, *McGregor 18468*.

Endemic.

Resembling *Distichophyllum* in the flattened stems and spathulate leaves but distinguished by the papillose peristome teeth without any median furrow.

113. Genus DISTICHOPHYLLUM Doz. and Molk.

Distichophyllum DOZ. & MOLK., Musc. Frond. ined. Archip. Ind. (1846) 99.

Medium-sized or robust plants with flattened, sparingly branched stems. Leaves dimorphous, dorsal and ventral rows differentiated, crowded, complanate, ovate or spathulate, entire, pointed or rounded at apex, with a narrow border of elongated cells; cells hexagonal, smooth, laxer at base; costa single, ending near or above midleaf. Seta smooth or papillose; capsule erect or pendulous; peristome teeth finely striolate, deeply furrowed along median line; calyptra small, fringed, naked or pilose.

Key to the species of Distichophyllum.

1. Leaves ending in a long, cuspidate point .... 1. *D. cuspidatum.*
Leaves muticous or with a small apiculus .... 2.
2. Leaves coarsely toothed above .... 4. *D. Santosii.*
Leaves entire or minutely crenulate above .... 3.
3. Seta smooth, small plants .... 4.
Seta papillose, robust plants .... 5.
4. Costa ending near apex, marginal leaf cells much smaller than juxtacostal cells .... 2. *D. nigricaule.*
Costa ending about midleaf, upper leaf cells nearly uniform. 3. *D. subnigricaule.*
5. Leaves not bordered in upper half .... 5. *D. Osterwaldii.*
Leaves bordered all around .... 6.
6. Leaves sharply apiculate, upper cells large, 40 to 45 wide.... 6. *D. tortile.*
Leaves minutely apiculate, upper cells much smaller........ 7. *D. Mittenii.*

1. **DISTICHOPHYLLUM CUSPIDATUM** Doz. and Molk. Plate 19, fig. 322.

Distichophyllum cuspidatum Doz. & Molk., Musc. Frond. ined. Archip. Ind. (1846) 101, *pl. 33.*

Synoicous and autoicous; stems about 1 cm high, densely foliate, 4 mm wide with leaves. Leaves much contorted when dry, about 3 mm long, oblong-lanceolate, abruptly contracted to a long, sharp, cuspidate point, bordered all around with 3 or 4 rows of linear, porose, yellowish pellucid cells, confluent at apex with entire point which is about ⅓ as long as blade; costa slender, ending well below base of acumen; cells hexagonal, collenchymatous, 15 to 20 μ in diameter, laxer and rhomboidal near insertion. Seta slender, smooth, curved at tip, 5 mm long; capsule small, ovoid, nodding; calyptra naked, fringed.

MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 2672*.

Distribution: Ceylon, Sumatra, Java, New Caledonia, New Guinea, Society Islands.

On bark of trees. Distinguished from all the allied species by the long cuspidate leaf points.

2. **DISTICHOPHYLLUM NIGRICAULE** Mitt. Plate 19, fig. 323.

Distichophyllum nigricaule Mitt., Bryol. Jav. 2 (1861) 19.
Distichophyllum Elmeri Broth., Leafl. Philip. Bot. 2 (1909) 656.

Dioicous; slender plants in lax tufts, dull yellowish green. Stems prostrate, dark brown or black, laxly foliate, usually simple. Leaves strongly crisped and contorted when dry, up to 3 mm long and 1.5 mm wide in lateral rows, ovate from a subspathulate base, rounded at apex and apiculate, with a narrow, hyaline border all around, 4 to 5 rows wide below and 2 or 3 rows wide above; margins entire, more or less undulate; costa slender, ending some distance under apex; juxtacostal cells hexagonal, 25 to 30 μ, gradually much smaller toward margins, very lax toward costa at base. Ventral and dorsal leaves smaller. Sporophyte not seen.

LUZON, Benguet Subprovince, Baguio, *Elmer 8716*; Laguna Province, Mount Maquiling, *Hadden 137, 137a*.

Distribution: Java.

In this species the variation in leaf form, even on the same stem, is quite marked, so that I fail to see how *D. Elmeri* can be maintained. The variations are well shown in plate 147 of the Bryologia Javanica. I have not seen the specimen cited in the original description, but *No. 8716*, determined by Brotherus as *D. Elmeri*, seems to be substantially the same thing and differs in no way that I can see from *D. nigricaule*.

3. **DISTICHOPHYLLUM SUBNIGRICAULE** Broth. Plate 13, fig. 224.

Distichophyllum subnigricaule BROTH., Philip. Journ. Sci. 31 (1926) 289.

Slender pale-green plants in dense, flat mats. Stems prostrate, flat, 2.5 mm wide with leaves. Leaves slightly contorted when dry, to 1.5 mm long, spathulate, entire, broadly rounded, muticous or minutely apiculate; costa faint, ending near midleaf; cells hexagonal, about 30 μ wide near costa, very little smaller toward margins, very lax and subrectangular at base, bordered all around with 2 rows of linear, hyaline cells.

MINDANAO, Zamboanga Province, *Merrill 8824*.

Endemic.

Distinct from *D. nigricaule* in the more uniform cell structure and consequently less strongly contorted leaves when dry. I have a suspicion that further collections may narrow the gap between this species and *D. gracilicaule* Fleisch., to which it is evidently closely allied.

4. **DISTICHOPHYLLUM SANTOSII** Bartram sp. nov. Plate 13, fig. 225.

Humile, molle, sordide albescens. Caulis ad 2 cm longus ramosus. Folia complanata, e basi longa, sensim anguste spathulato-lingulata, apice rotundata; margines superne denticulati; limbus angustissimus, 1 seriatus circumductus, apicem versus indistincte evolutus; costa tenuis, brevis; cellulae laxae, hexagonae, 30 to 40 μ latae, ad marginem paulo minores, basilares elongatae. Seta rubra, curvata, ubique alte papillosa; theca inclinata, mamillosa.

Rather small, soft, pale-green plants in dense mats. Stems prostrate or decumbent, branched, to 2 cm long. Leaves crowded, not at all contorted when dry, complanate, narrowly spathulate-lingulate from a long base, rounded at apex, bluntly toothed by projecting marginal cells in upper third, to 3 mm long and 0.6 mm wide, border narrow and indistinct, of one series of elongated cells below and merging with projecting marginal cells above; costa faint, short, ending near midleaf; cells very lax, hexagonal, 30 to 40 μ wide above, very little smaller toward margins, rectangular and delicate toward base. Perichætial leaves small, obtuse, bluntly toothed above; seta deep red, curved, highly papillose throughout, 5 to 6 mm long; capsule inclined, ovoid-cylindric, mamillose; peristome teeth pale, 225 μ high, with a narrow median furrow. Lid and calyptra not seen.

LUZON, Tayabas Province, Baler, Kabatangan, *J. V. Santos 281*.

Endemic.

On decaying stump. This curious little species is widely distinct from all of its congeners in the narrow, rounded leaves bluntly toothed about ⅓ of the way down. The large hexagonal cells are uniform throughout the width of the leaf, so that the blade is flat when dry. I take pleasure in naming the plant for the collector, Mr. Jose V. Santos.

5. DISTICHOPHYLLUM OSTERWALDII Fleisch. Plate 19, fig. 326.

Distichophyllum Osterwaldii FLEISCH., Laubmfl. Java 3 (1908) 994.

Dioicous; robust, laxly tufted plants, dull brownish green. Stems ascending from a rhizomatous base, to 7 cm high, simple or forked, laxly foliate, flat, 7 to 8 mm wide with leaves. Leaves strongly undulate-crispate when dry, lateral rows widely spreading, lingulate, 4 mm long and 1.5 mm wide, broadly rounded above and muticous, bordered slightly more than half way up with 3 or 4 rows of linear, pellucid cells; margins undulate, minutely crenulate above where unbordered; costa slender, extending more than ¾ of way up the leaf; cells irregularly hexagonal, 25 to 35 μ near costa, smaller toward margins, laxer and elongate near base. Dorsal and ventral leaves smaller. Seta 5 to 7 mm long, flexuose, papillose; capsule nodding, urn 1 mm long; peristome yellow, teeth with a wide median furrow; calyptra small, fringed, strongly scabrous.

LUZON, Benguet Subprovince, Baguio, *Williams 1668*. MINDORO, Puerto Galera, *Bartlett 13845*. NEGROS, Oriental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 9610*, *Chapman 42*.

Distribution: Java.

On damp, shaded banks. The muticous leaves, not bordered toward the apex, and the smaller lamina cells readily separate this species from *D. tortile*.

6. DISTICHOPHYLLUM TORTILE Bryol. Jav. Plate 19, fig. 327.

Distichophyllum tortile Bryol. Jav., Bryol. Jav. 2 (1861) 127.

Robust plants with the habit and appearance of *D. Osterwaldii*. Leaves oblong-lingulate, apiculate at apex, entire, bordered all around with 4 or 5 rows of linear cells. Upper leaf cells to 45 to 50 µ wide. Seta very scabrous above; calyptra larger, nearly smooth above.

LUZON, Bataan Province, upper Lamao River, *Williams 851*.

Distribution: Java, Banca.

On wet rocks.

7. DISTICHOPHYLLUM MITTENII Bryol. Jav. Plate 19, fig. 328.

Distichophyllum Mittenii Bryol. Jav., Bryol. Jav. 2 (1861) 25.

Autoicous and synoicous; usually robust, yellowish-green plants in lax tufts. Stems prostrate or ascending, to 4 cm long, simple or forked, flat, about 5 mm wide with leaves. Leaves very slightly contorted when dry, crowded, lateral rows spreading, 3 mm long and 1.5 mm wide, spathulate-lingulate from a narrow base, broadly rounded above and usually with a minute apiculus, very narrowly bordered with a single row of linear cells; costa slender, extending more than ¾ up the leaf; cells irregularly hexagonal, 25 to 30 µ wide near costa, much smaller toward margin, very lax and rhomboidal at base. Seta very rough, 7 to 8 mm long; capsule small; calyptra scabrous.

BATANES, Mount Iraya, *Fenix 3854*. LUZON, Benguet Subprovince, Baguio, *Williams 1667*. PALAWAN, Mount Gantung, *Edaño 80892* in part. MINDORO, Puerto Galera, *Bartlett 13843*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 36*.

Distribution: Ceylon, Malay Peninsula, Java, Aneityum, New Caledonia, Formosa.

On bark of trees. In this species the leaves are only slightly undulate and narrowly bordered with one row of elongated cells. The cells are appreciably smaller than in *D. tortile*.

114. Genus ERIOPUS (Brid.) C. M.

Eriopus (Brid.) C. M., Bot. Zeit. (1847) 828.
Chaetephora § *Eriopus* Brid., Bryol. Univ. 2 (1827) 339.

Medium-sized, brownish-green plants in laxt tufts. Stems wiry, prostrate or ascending, simple or forked, flat, laxly foliate, usually with conspicuous clusters of brown, filiform propagula in upper leaf axils. Lateral leaves spreading, dorsal and ventral rows smaller and erect, ovate, short-acuminate, scarious, bordered, serrate above; costa short and forked; cells lax, hexagonal or rhomboidal, smooth. Seta strongly spinose; capsule small, subpendulous; peristome teeth with a median furrow; calyptra naked or pilose, fringed.

Key to the species of Eriopus.

1. Upper leaf cells oval-hexagonal, 30 to 40 μ long.......... 1. *E. parviretus*.
   Upper leaf cells rhomboidal, 50 to 70 μ long.............................. 2.
2. Stems densely foliate, blunt at tips.............................. 2. *E. remotifolius*.
   Stems laxly foliate, attenuate at tips ... .. 3. *E. flaccidus*.

1. ERIOPUS PARVIRETUS Fleisch. Plate 19, fig. 324.

Eriopus parviretus Fleisch., Laubmfl. Java 3 (1908) 1068.
Eriopus microblastus Broth., Philip. Journ. Sci. § C 8 (1913) 82.

Dioicous; pale-green, glossy plants in lax tufts. Stems to 3 cm long, wiry, laxly foliate, flat, simple or forked, more or less attenuate at tips, often with dense clusters of brown, filiform propagula in upper axils or at tips. Lateral leaves ovate, 3 mm long and 1.5 mm wide, abruptly short-acuminate, sharply serrate in upper half, bordered all around with 2 to 4 rows of linear cells; costa short, faint, double, unequally forked; cells oval-hexagonal, slightly collenchymatous, 16 to 20 μ wide and 1½ to 2 times as long, slightly larger and laxer toward base. Dorsal and ventral leaves smaller. Perichætial leaves 1.5 to 2 mm long, slenderly cuminate, denticulate; seta 5 to 6 mm long, curved at tip, lower spines about 75 μ long, gradually longer upward, upper spines 150 to 180 μ long; capsule ovoid, inclined; calyptra copiously ciliate at base and more or less pilose above.

LUZON, Laguna Province, Mount Banahao, *Robinson 9815*: Cagayan Province, Mount Bahatugin, *Edaño 79703*. NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 23*.

Distribution: Java.

On trees. Brotherus distinguishes *E. microblastus* from *E. parviretus* by the more strongly serrate leaves, but the plants fail to show this distinction. As far as I can see they are identical.

2. ERIOPUS REMOTIFOLIUS C. M. Plate 19, fig. 330.

Eriopus remotifolius C. M., Bot. Zeit. (1847) 828.

Robust pale-green plants tinged or flecked with brown, growing in small, dense tufts. Stems ascending, up to 6 cm long, simple or forked, blunt at tips, very flat, 7 to 8 mm wide with leaves, with numerous axillary clusters of brown, filiform propagula. Lateral leaves oblong-ovate, short-acuminate, up to 4.5 mm long and 1.5 mm wide, longitudinally folded in several short pleats near apex, coarsely serrate in upper half with long, slender, spinose teeth, bordered all around with 3 or 4 rows of elongated cells; costa double, short, forked, very indistinct; cells rhomboidal with firm, yellowish walls, about 25 μ wide and 2 to 3 times as long, laxer below. Sporophyte not seen.

LUZON, Laguna Province, Mount Banahao, *McGregor 47452*.

Distribution: Sumatra, Java, Borneo, New Guinea.

On trees. More robust than *E. parviretus* and sharply distinct in the spinose toothed leaves and larger, rhomboidal areolation.

3. ERIOPUS FLACCIDUS Broth. Plate 19, fig. 331.

Eriopus flaccidus BROTH., Philip. Journ. Sci. § C 13 (1918) 213.

Dioicous; rather slender, laxly tufted plants. Stems to 6 cm long, more or less attenuate at tips. Lateral leaves spreading, asymmetrical, oblong-ovate, short-acuminate, coarsely serrate above; costa and areolation as in *E. remotifolius*. Perichætial leaves ovate, abruptly subulate-acuminate; seta 7 to 8 mm long, curved at tip, upper spines 0.225 mm long, shorter toward base.

LUZON, Laguna Province, Mount Banahao, *Merrill 7523*.

Endemic.

On damp banks. This species is not very convincing in comparison with *E. remotifolius*. The slender, lax habit and attenuate stems are hardly characters of major importance. As the species of this genus are rarely found in fruit, the sporophyte characters are not of much practical value in making determinations.

115. Genus CYCLODICTYON Mitt.

Cyclodictyon MITT., Journ. Linn. Soc. 7 (1864) 163.

Medium-sized, soft, delicate plants without lustre, growing in flat mats. Stems prostrate, branched, flat. Leaves very laxly areolate, complanate, oblong-ovate, short-acuminate, narrowly bordered, more or less toothed above; costa double, extending beyond midleaf; cells large, rounded-hexagonal, smooth. Seta elongate, smooth; capsule horizontal; peristome teeth striolate, deeply furrowed; lid long-beaked; calyptra naked.

CYCLODICTYON BLUMEANUM (C. M.) Broth. Plate 19, fig. 331.

Cyclodictyon Blumeanum (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1907) 934.
Hookeria Blumeana C. M., Syn. 2 (1851) 676.

Synoicous and autoicous. Dull, whitish-green plants in dense, flat mats. Stems prostrate, to 4 cm long, irregularly pinnate, strongly flattened. Leaves rather crowded, complanate, lateral rows spreading, oblong-ovate, lightly concave, abruptly short-acuminate, about 1.5 mm long, narrowly bordered all around with 1 or 2 rows of linear cells, coarsely toothed toward apex; costa double with divergent forks, smooth, extending more than ⅔ up the leaf; cells rounded-hexagonal, 30 to 40 μ in diameter, more elongate and lax toward base, linear at margins in 1 or 2 rows forming a very narrow border. Seta 1.5 to 2 cm long, reddish; capsule horizontal, subcylindric, urn 1.5 to 2 mm long; peristome teeth brown, transversely striolate, with a wide median furrow; calyptra naked, laciniate at base.

LUZON, Benguet Subprovince, Baguio, *Williams 1740*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 33*. MINDANAO, Bukidnon Province, Tangculan, *Ramos & Edaño 37175, 37180;* Davao Province, Todaya, Mount Apo, *Williams 2652;* Sibuyan River, *Copeland 977*.

Distribution: Ceylon, Sumatra, Java, New Guinea, Formosa.

On rotten logs, seldom on rocks. The whitish, delicate, laxly areolate leaves with long, divergent costæ are unmistakable. In color and habit these plants suggest *Leskeodon philippinensis*, but the leaf structure and fruit are quite different.

116. Genus CALLICOSTELLA (C. M.) Mitt.

Hookeria § V. *Callicostella* C. M., Syn. 2 (1851) 216.
Callicostella (C. M.) MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 136.

Medium-sized plants resembling *Cyclodictyon* but less delicate. Stems prostrate, branched, slightly flattened. Leaves oblong-lingulate, complanate, rounded or abruptly short-acuminate and toothed above, not bordered; costa double with divergent forks ending near apex; cells small, angular, irregularly oval, mostly papillose, elongate and smooth below. Seta smooth or papillose; capsule horizontal; peristome as in *Cyclodictyon*; calyptra more or less scabrous.

Key to the species of Callicostella.

Leaf apex coarsely toothed, cells strongly papillose .... 1. *C. papillata.*
Leaf apex crenulate, cells nearly smooth .... 2. *C. prabaktiana.*

1. **CALLICOSTELLA PAPILLATA** (Mont.) Mitt. Plate 20, fig. 131.

Callicostella papillata (Mont.) Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 136.

Hookeria papillata Mont., Ann. Sci. Nat. 4 (1859) 93.

Synoicous; dull sordid or brownish-green plants in flat mats. Stems prostrate, irregularly branched. Leaves complanate, more or less curved and plicate when dry, oblong-lingulate, abruptly short-acuminate, 1 to 1.5 mm long, coarsely and irregularly toothed at apex; costa double, ending abruptly near apex, usually bluntly toothed on back near tips; cells angular, irregular in shape, about 10 μ wide, with a single large papilla over lumen, more elongate and smooth toward base. Seta red, smooth, 8 to 20 mm long, curved at tip; capsule horizontal, ovoid-cylindric; peristome as in *C. Blumeanum*; calyptra large, reddish brown, scabrous above.

Frequent and probably well distributed over all the islands at moderate altitudes.

Distribution: India, Sumatra, Java, Borneo, Pacific Islands.

On rotten logs. A variable species of wide distribution. Slightly more robust plants with the leaves more gradually acuminate as referred to form *longifolia* by Fleischer. This form is represented locally by a specimen from Mount Binuang, Tayabas Province, Luzon, *Ramos & Edaño 28094.*

2. **CALLICOSTELLA PRABAKTIANA** (C. M.) Bryol. Jav. Plate 20, fig. 134.

Callicostella prabaktiana (C. M.) Bryol. Jav., Bryol. Jav. 2 (1862) 40.

Hookeria Prabaktiana C. M., Syn. 2 (1851) 678.

Synoicous; very much like *C. papillata* in coloring and habit. Leaves broadly rounded or bluntly apiculate and minutely crenulate at apex; cells irregularly hexagonal, smooth or very faintly mamillose, more elongate near base; costa double, with divergent forks ending in a blunt spine near leaf apex. Seta 12 to 14 mm long, slightly scabrous above and often throughout.

MINDANAO, Bukidnon Province, near Silipan, *L. H. Phillips 11, 12.*

Distribution: Java, Borneo, Annam, New Caledonia.

On shaded rocks and banks. This species is not uncommon in adjacent Malaysia and may be easily separated from *C. papillata* by the nearly smooth leaf cells and less strongly toothed apical margins.

117. Genus HOOKERIOPSIS (Besch.) Jaeg.

Hookeriopsis (Besch.) JAEG., Adumbr. 2 (1874–1875) 262.
Hookeria subgen. *Hookeriopsis* BESCH., Ann. Sci. Nat. (1876).

Medium-sized plants. Stems irregularly branched, flattened, creeping. Leaves complanate, ovate, short-pointed, serrate in upper half; costa double, ending above midleaf; cells long-hexagonal, smooth. Seta elongate, smooth or scabrous above; capsule horizontal, ovoid-cylindric; peristome teeth striolate, with a median furrow; calyptra naked, lobed at base.

HOOKERIOPSIS GEMINIDENS Broth. Plate 20, fig. 335.

Hookeriopsis geminidens BROTH., Philip. Journ. Sci. § C 5 (1910) 156.

Rather glossy yellowish-green plants strongly tinged with reddish purple. Stems irregularly branched, flattened, densely foliate, 3 mm wide with leaves. Lateral leaves spreading, more or less contorted when dry, oblong-ovate, abruptly acute, concave, 2.5 mm long and 1 mm wide, coarsely and irregularly serrate in upper half, teeth long, widely spreading and occasionally double-pointed; costa double, with divergent forks, smooth on back, ending slightly above midleaf; cells oval-hexagonal, 10 to 12 μ wide and 3 to 4 times as long, narrower and linear toward margins, larger and laxer below. Inflorescence and sporophyte unknown.

LUZON, Benguet Subprovince, *Bacani 15929*.

Endemic.

When this plant becomes better known through more perfect specimens it will possibly prove to be inseparable from some of the closely allied species in the surrounding regions.

118. Genus ACTINODONTIUM Schwaegr.

Actinodontium SCHWAEGR., Suppl. 2 pt. 2 fasc. 1 (1826) 75.

Heteroicous; rather small, dull yellowish-green plants in small tufts. Stems ascending, radiculose below, simple, densely foliate. Leaves, ovate-lanceolate, acuminate, subentire; costa double, elongate; cells elongate, smooth. Capsule erect, subcylindric;

lid long-beaked; peristome teeth papillose, bordered; calyptra naked, laciniate at base.

ACTINODONTIUM RHAPHIDOSTEGUM (C. M.) Bryol. Jav. Plate 10, fig. 186.

Actinodontium rhaphidostegum (C. M.) Bryol. Jav., Bryol. Jav. 2 (1862) 37.

Hookeria rhaphidostega C. M., Syn. 2 (1851) 677.

Stems 1 to 1.5 cm high. Leaves crowded, slightly shrunken and flexuose when dry, erect-spreading when moist, oblong-lanceolate, gradually long-acuminate, slightly plicate, 3 to 3.5 mm long, entire or with a few minute teeth near apex; costa double, smooth, slightly divergent, forks unequal and extending beyond midleaf; cells chlorophyllose, linear-rhomboidal, smooth, thin-walled, 10 to 12 μ wide and 8 to 10 times as long, narrower toward margins and laxer toward base. Perichætium small; seta erect, smooth, 8 to 10 mm long; capsule erect, narrowly ovoid-cylindric, urn 2.5 mm long; lid conic-rostrate; peristome teeth with a zigzag median line, densely papillose, bordered by wide dorsal plates, segments of endostome narrow, from a low basal membrane; calyptra deeply laciniate at base.

LUZON, Benguet Subprovince, Baguio, *Williams 1664*.

Distribution: Java, Celebes, Borneo.

On coffee trees. The acuminate leaves and papillose peristome teeth with a fine median line are good diagnostic characters.

119. Genus CHAETOMITRIUM Doz. and Molk.

Chaetomitrium Doz. & Molk., Musc. Frond. ined. Archip. Ind. (1846) 117.

Pseudoautoicous, male flower gemmiform on upper surface of leaves. Small or medium-sized plants growing in dense tufts or mats on trees. Stems elongate, creeping, more or less regularly pinnate, frequently with axillary clusters of brood filaments on ultimate branches. Leaves widely spreading, ovate, concave, short acuminate or rounded, usually strongly toothed; costa double and short or none; cells linear, shorter near apex, generally more or less papillose. Perichætium large; seta elongate, papillose or setose; capsule more or less inclined; lid long-rostrate; peristome teeth striolate, not furrowed; calyptra always strongly hispid or spinose-ciliate, usually fringed at base.

Key to the species of Chaetomitrium.

1. Leaves tuberculate or spinose on back .... 2.
   Leaves not armed on back .... 3.

2. Seta 2 to 2.5 cm long, papillose above........................ 2. *C. Elmeri.*
   Seta 1 cm long, setose above........................ 3. *C. perarmatum.*
3. Calyptra cucullate, not or scarcely fringed .... 1. *C. lanceolatum.*
   Calyptra mitriform, fringed at base .... 4.
4. Branches flattened, leaves complanate .... 4. *C. Weberi.*
   Branches not flattened, leaves spreading on all sides........................ 5.
5. Seta setose above .... 5. *C. orthorrhynchum.*
   Seta papillose above........................ 6.
6. Small plants, branch leaves 1 mm or less long........ 6. *C. papillifolium.*
   Robust plants, branch leaves 1.5 to 2 mm long........................ 7.
7. Branch leaves in spiral rows .... 7. *C. seriatum.*
   Branch leaves not seriate........................ 8.
8. Seta densely spinose to hispid above .... 9. *C. laevifolium.*
   Seta papillose above........................ 9.
9. Leaf apex rounded and blunt .... 10. *C. Warburgii.*
   Leaf apex acutely pointed........................ 10.
10. Apical margins weakly denticulate, cells papillose.. 8. *C. philippinense.*
    Apical margins sharply serrate, cells smooth.... 11. *C. pseudo-elongatum.*

1. **CHAETOMITRIUM LANCEOLATUM** Bryol. Jav. Plate 20, fig. 137.

Chaetomitrium lanceolatum Bryol. Jav., Bryol. Jav. 2 (1862) 40.

Small, golden-green plants growing in compact mats, glossy. Stems densely pinnate, branches short, 6 to 8 mm long, rather laxly foliate, often with clusters of filamentose propagula near tips. Stem leaves erect-spreading, ovate-lanceolate, abruptly acuminate, contracted at apex, 1 to 1.5 mm long, denticulate all around; branch leaves smaller, concave, more gradually acuminate, to 1 mm long, coarsely serrate toward apex, ecostate; cells linear, smooth or faintly papillose at apical angles. Perichaetial leaves ciliate-dentate above; seta 6 to 10 mm long, smooth below, densely setose above; capsule nodding or horizontal; calyptra cucullate, hispid, slightly ciliate at base.

LUZON, Benguet Subprovince, *Williams 1723.*

Distribution: Java.

Similar in many respects to *C. papillifolium* but readily distinguished by the cucullate calyptra weakly ciliate at the base and the setae densely setose in the upper half.

2. **CHAETOMITRIUM ELMERI** Broth. Plate 20, fig. 136.

Chaetomitrium Elmeri BROTH., Leafl. Philip. Bot. 6 (1913) 1974.

Rather robust plants in dense mats, yellowish green tinged with brown below, slightly glossy. Stems creeping, densely pinnate, branches tumid and terete, densely foliate, about 1 cm long. Leaves lingulate, deeply concave, broadly rounded or truncate, about 1 mm long, with numerous large knoblike tubercles in transverse rows on back above middle; margins erect, crenulate across apex; costa double, unequal, longer fork extending about ⅓ up the leaf; cells linear, slightly papillose at apical angles, shorter near apex. Seta 2 to 2.5 cm long, papillose above, essentially smooth below; capsule inclined; calyptra (immature) narrow, densely hispid throughout, split on one side at base, not fringed.

SIBUYAN, Capiz Province, Magallanes, Mount Giting-Giting, *Elmer 12398* (type). PANAY, Capiz Province, Libacao, Taguacan, *Martelino & Eduño 35778*.

Endemic.

A very curious and unusual plant in the large, transversely seriate tubercles on the back of the leaf. Although similar to *C. perarmatum* it differs widely in the rounded, crenulate leaf apex and the papillose setæ.

3. **CHAETOMITRIUM PERARMATUM** Broth. Plate 20, fig. 139.

Chaetomitrium perarmatum BROTH., Philip. Journ. Sci. 34 (1926) 290.

Less robust than *S. Elmeri*, pale green. Stems densely pinnate, branches slightly flattened, not terete, laxly foliate. Leaves oblong-lingulate, abruptly rounded and apiculate, 0.6 to 0.8 mm long, coarsely and irregularly serrate in upper half, with numerous sharp, spinelike projections scattered over back above middle; costa double, unequal, longer fork extending to about midleaf; cells linear, minutely spiculose at apical angles. Seta 8 to 10 mm long, densely setose above, smooth below; capsule inclined; lid with a long, slender beak; calyptra cucullate, split on one side to above middle, densely hispid, not fringed.

LUZON, Apayao Subprovince, *Fenix 25935*.

Endemic.

On twigs of small shrub. Brotherus describes the calyptræ as mitriform and fimbriate at the base, but when matured they are definitely cucullate and naked on the basal edge.

4. **CHAETOMITRIUM WEBERI** Broth. Plate 20, fig. 140.

Chaetomitrium Weberi BROTH., Philip. Journ. Sci. 8 C 8 (1913) 83.

Relatively robust, densely tufted plants, pale golden green, glossy. Stems densely branched, branches ascending, to 1 cm long, densely foliate, flattened, 3 mm wide with leaves. Branch leaves oblong-ovate, concave, lateral rows widely spreading, 2 mm long, short-acuminate, slightly contracted below apex, denticulate above; costa double, short; cells linear, papillose at apical angles. Perichætial leaves gradually acuminate, ciliate-toothed above; seta smooth below; calyptra mitriform, long and densely ciliate toward base, hispid and ramentose above (sporophyte very immature).

MINDANAO, Agusan Province, *Weber 1309* (type); Sax River, *Williams 3159* with immature sporophyte.

Endemic.

A fine, distinct species characterized by the robust habit and strongly flattened branches.

3. **CHAETOMITRIUM ORTHORRHYNCHUM** (Doz. and Molk.) Bryol. Jav. Plate 24, fig. 341.

Chaetomitrium orthorrhynchum (Doz. & Molk.) Bryol Jav., Bryol. Jav. 2 (1862) 46.

Hookeria orthorrhyncha DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 305.

Small, golden-green plants in dense mats. Stems densely pinnate and bipinnate, branches slender. Leaves ovate-lanceolate, acuminate, to 1.2 mm long, ultimate branch leaves smaller, concave, constricted below apex, sharply serrate ⅓ of the way down, teeth spreading and often bigeminate at apex; costa double, short, faint; cells linear, sharply spinose-papillose at apical angles, especially on back of leaf. Perichætial leaves ciliate-dentate; seta 6 to 10 mm long, smooth below, setose above, calyptra mitriform, spinose-hispid above, long-ciliate toward base.

LUZON, Tayabas Province, Binnang, *Ramos & Edaño 28988* in part. POLILLO, *McGregor 10511*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 11, 28*. BASILAN, *Reillo 16267*. MINDANAO, Cotabato Province, *Weber 1521*.

Distribution: Sumatra, Java, Borneo, Celebes.

On twigs of trees. The smallest of the local species. Distinct from *C. papillifolium* in the sharper, more coarsely serrate leaves and the rougher seta. The Negros plants represent a well-marked form with most of the leaves strongly spinose on the back.

4. **CHAETOMITRIUM PAPILLIFOLIUM** Bryol. Jav. Plate 24, fig. 342.

Chaetomitrium papillifolium Bryol. Jav., Bryol. Jav. 2 (1862) 50.

Slightly larger than *C. orthorrhynchum* when well developed. Stems densely branched, branches more or less curved. Branch leaves usually homomallous, oblong-lanceolate, abruptly short-acuminate, constricted below apex, denticulate in upper half, very minutely toothed below; costa double, short; cells linear, usually sharply papillose at apical angles. Perichætial leaves ciliate-dentate; seta 6 to 10 mm long, papillose above, smooth below; calyptra mitriform, sparsely hispid above with scattered appressed cilia, long-ciliate toward base.

LUZON, Nueva Vizcaya Province, *McGregor 14848*. MINDANAO, Agusan Province, *Weber 1323* in part, *1498*: Lanao Province, Pugaan Hill, *Bartlett 15912, 15913*.

Distribution: Ceylon, Java, Borneo, Cochin China.

Well marked by the small size, the weakly toothed leaves, and the setæ only slightly scabrous above.

7. **CHAETOMITRIUM SERIATUM** Broth. Plate 20, fig. 143.

Chaetomitrium seriatum BROTH., in herb.

C. bornensi Mitt. proximum; differt foliis superne minute denticulatis, apice rotundato-obtusis, valde constrictis, truncatis vel minute apiculatis.

Robust plants, dull yellowish green, densely tufted. Stems elongate, pinnate, branches suberect, 2 cm long, tumid, obtuse. Branch leaves crowded, erect-spreading, distinctly imbricated in spiral rows, oblong-lingulate, deeply concave, broadly rounded or truncate at apex and often minutely apiculate, constricted below apex into a definite throat; margins broadly inflexed above, denticulate toward apex, subentire below; costa very short and weak; cells linear, smooth or minutely papillose at apical angles, shorter near apex. Perichætial leaves short-acuminate, bluntly serrate; seta 7 to 8 mm long, papillose above, smooth below; capsule inclined; lid subulate-rostrate; calyptra large, mitriform, coarsely hispid above, long-ciliate toward base.

MINDANAO, Agusan Province, *Weber 1496*.

Endemic.

A fine, distinct species near *C. bornense* Mitt. but distinguished by the leaf apex which is constricted to a throat, as in *Thyridium constrictum*, and broadly rounded or even truncate, usually with a minute apiculus. In *C. bornense*, as represented by Motley's *No. 4*, the leaves are abruptly contracted to a short, sharp, acuminate point.

8. **CHAETOMITRIUM PHILIPPINENSE** (Mont.) Bryol. Jav. Plate 20, fig. 144.

Chaetomitrium philippinense (Mont.) Bryol. Jav., Bryol. Jav. 2 (1862) 44.

Hookeria philippinensis MONT., Lond. Journ. Bot. (1845) 11.

Relatively robust plants, yellowish green tinged with brown, slightly glossy. Stems densely pinnate, branches to 18 mm long, densely foliate, slightly curved, 2.5 to 3 mm wide with leaves. Branch leaves laxly spreading, oblong-ovate, to 1.5 mm long, deeply concave especially near constricted apex, abruptly contracted to a very short, acute point; margins erect below, broadly reflexed and undulate near apex, denticulate above and minutely toothed to base; costa short; cells linear, papillose at apical angles. Perichætial leaves acuminate, ciliate-dentate; seta 6 to 7 mm long, papillose above, smooth below; capsule slightly inclined; calyptra spinose-hispid above, long-ciliate below.

PANAY, Iloilo Province, Alimunan River, *Robinson 18164*. MINDANAO, Agusan Province, *Weber 1292, 1306*.

Distribution: Java, Ceram.

On tree branches. This species has close allies in *C. pseudo-elongatum* and *C. Warburgii*. The distinctions are noted under the respective species. When a large series of specimens is available it will be interesting to see if the variations in leaf characters are constant enough to maintain the specific segregates.

9. CHAETOMITRIUM LAEVIFOLIUM Dix. Plate 10, fig. 315.

Chaetomitrium laevifolium DIX., in herb.

C. philippinensi peraffine sed seta superne dense spinoso-hispida, cellulae laevissimae.

Robust, pale yellowish-green glossy plants, densely matted together. Branches to 12 mm long, slightly flattened. Leaves laxly spreading, deeply concave, constricted under apex, 1.5 mm long, short-pointed; apical margins slightly undulate, denticulate; cells linear, smooth. Perichætial leaves strongly ciliate-toothed; seta 6 to 7 mm long, densely spinose-hispid nearly to base, upper spines to 75 μ long; calyptra large, spinose-hispid above, long ciliate toward base.

PALAWAN, Mount Mantalingahan, *Edaño 80842*.

Endemic.

Sharply distinct from the allied species in this group in the densely spinose setæ.

10. CHAETOMITRIUM WARBURGII Broth. Plate 10, fig. 316.

Chaetomitrium Warburgii BROTH., Monsunia 1 (1900) 46.

Robust plants resembling *C. philippinense*. Stems densely pinnate, branches up to 2 cm long. Leaves crowded, lightly plicate, oblong-ovate, deeply concave, 1.5 mm long, broadly rounded and blunt at apex, denticulate in upper half; apical margins undulate and slightly reflexed; cells linear, smooth; costa short; Perichætial leaves laciniate at apex and strongly toothed; seta 8 to 9 mm long, strongly papillose above, smooth below; calyptra as in *C. philippinense.*

POLILLO, *McGregor, 10518.* MINDANAO, Agusan Province, *Weber 1328* in part, *1289* in part.

Distribution: Borneo.

The plants I have seen are, if anything, more robust than *C. philippinense* and differ markedly in the leaf apex which is broadly rounded, bluntly pointed, or, in some leaves, almost truncate. The laciniate perichætial leaves may prove to be a good diagnostic character.

11. **CHAETOMITRIUM PSEUDO-ELONGATUM** Broth. Plate 29, fig. 347.

Chaetomitrium pseudo-elongatum BROTH., Monsunia (1900) 47.

Resembling *C. philippinense* in habit and color. Branch leaves deeply concave, constricted below apex; apical margins strongly undulate, coarsely and sharply serrate; cells linear, smooth. Seta 7 mm long, papillose above, smooth below.

TAWITAWI, *Warburg 13650.*

Endemic.

Very close to *C. philippinense* but apparently distinct in the coarsely serrate leaf apex and smooth cells.

120. Genus CHAETOMITRIOPSIS Fleisch.

Chaetomitriopsis FLEISCH., Laubmfl. Java 4 (1921) 1371.

Autoicous; slender, wiry, yellowish-green glossy plants in compact, intricate tufts. Stems creeping, densely pinnate and bipinnate. Branch leaves squarrose-spreading with decurved points, ovate, acuminate; costa double, short; cells elongate, papillose at apical angles. Seta long, smooth; capsule pendulous; peristome double; lid conical, short; calyptra cucullate, sparingly pilose.

CHAETOMITRIOPSIS GLAUCOCARPA (Reinw.) Fleisch. Plate 29, fig. 348.

Chaetomitriopsis glaucocarpa (Reinw.) FLEISCH., Laubmfl. Java 4 (1921) 1372.

Hypnum glaucocarpon REINW. in Schwaegr. Suppl. 3 pt. 1 fasc. 2 (1828) *pl.* 235.

Stems up to 10 cm long. Stem leaves broadly ovate, long-acuminate; branch leaves crowded, orbicular-ovate, squarrose-spreading with deflexed points, to 0.7 mm long and 0.5 mm wide, short-acuminate; margins plane, sharply serrulate in upper half; costa double, short, forks unequal; cells linear-rhomboidal, 3 to 5 µ wide and 4 to 6 times as long, papillose at apical angles. Seta 2 to 3.5 cm long, slender, smooth, hooked at tip; capsule ovoid-cylindric, pendulous, covered with a waxy, granular bloom when young; lid conical, 0.5 mm long; peristome teeth striolate, with a zigzag median line; calyptra cucullate, sparsely pilose with long, erect hairs.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 19929, 20301, 20307, 20310:* Benguet Subprovince, Pauai, *Copeland 1831;* Baguio, *Elmer 8828, Merrill 7640, Williams 1842:* Kalinga Subprovince, Masingit, Lubuagan, *Ramos and Edaño 38217:* Bontoc Subprovince, Bauco, *Vanoverbergh 981, 1162, 2871:* Rizal Province, *Loher 15157:* Pampanga Province, Mount Abu, *Foxworthy 1926:* Abra Province, Mount Posuey, *Ramos 27098.* MINDANAO, Zamboanga Province, *Copeland 1750.*

Distribution: Sikkim, Java, Celebes, Formosa.

On branches and twigs of trees. Easily recognized by the neatly deflexed branch leaves, much as in *Meteoriopsis reclinata,* the long slender setæ, and the short lid.

31. Family SYMPHYODONTACEÆ

Dioicous; rather robust, glossy, tufted plants. Primary stems creeping; secondary stems weak, subpendulous, laxly pinnate, slightly complanate. Leaves ovate, concave, short-pointed, serrulate; costa double, short; cells linear. Seta elongate, scabrous above; capsule erect, densely spinulose; peristome double, teeth papillose, endostome with a low basal membrane; lid conic-subulate; calyptra cucullate, naked.

121. Genus SYMPHYODON Mont.

Symphyodon MONT., Ann. Sci. Nat. (1841) 279.

Plants with the characters of the family.

Key to the species of Symphyodon.

Robust plants, perichætial leaves serrulate, seta 2 to 3 cm long.
1. *S. Merrillii.*
Slender plants, perichætial leaves entire, seta 1.5 cm long.. 2. *S. Copelandii.*

1. SYMPHYODON MERRILLII Broth. Plate 20, fig. 143.

Symphyodon Merrillii BROTH., Philip. Journ. Sci. § C 2 (1907) 341.

Secondary stems to 4 cm long, irregularly pinnate, branches complanate, about 3 mm wide with leaves, short and blunt or occasionally attenuate in flexuose, flagelliform tips. Leaves erect-spreading, 1.5 to 2 mm long, oblong ovate, concave, acute or broadly acuminate, glossy and more or less undulate when dry; margins erect, sharply serrate toward apex; costa double, extending about ½ up the leaf, cells linear, 2 to 3 μ wide and 10 to 15 times as long, smooth or minutely papillose at apical angles, short and granulose across insertion. Perichætial leaves serrulate; seta 2 to 3 cm long, densely setulose above, smooth below; capsule erect, ovoid-cylindric, urn 2.5 mm long, densely spinulose with bluntly pointed spines up to 75 μ long; lid 2 mm long, slenderly beaked; calyptra large, cucullate, naked.

MINDORO, Mount Halcon, *Merrill 6198*.

Endemic.

On trees. When in fruit these curious plants are conspicuous by the erect, densely spinulose capsules. They are not likely to be confused with any other moss of the local flora.

2. SYMPHYODON COPELANDII Broth. Plate 24, fig. 439.

Symphyodon copelandii BROTH., Philip. Journ. Sci. 31 (1926) 291.

Secondary stems slender, pale yellow, glossy, laxly tufted, pendulous, to 5 cm long, bipinnate, complanate, scarcely 1.5 mm wide with leaves. Stem leaves laxly erect-spreading, ovate-lanceolate, broadly acute, concave, slightly decurrent, to 1.2 mm long; margins erect, serrulate toward apex; costa double, short; cells narrowly linear, papillose at apical angles, shorter and slightly colored across insertion. Leaves of ultimate branches much smaller and more coarsely toothed. Perichætial leaves entire; seta about 1.5 cm long, slender, scabrous above; capsule erect, oblong, densely spiculose.

LUZON, Benguet Subprovince, *Copeland 1587*.

Endemic.

A much more slender plant than *S. Merrillii* with smaller leaves and entire perichætial leaves. There are no developed sporophytes in the Bureau of Science specimen. These characters are transcribed from the original description.

32. Family LEUCOMIACEÆ

Slender, delicate plants growing in soft, flat mats. Stems elongate, irregularly branched, flattened, rather densely foliate. Leaves ovate-lanceolate, long-acuminate, entire, ecostate; cells very large and lax, smooth. Seta slender, slightly scabrous above; capsule horizontal; lid with a long, slender beak; annulus broad; peristome double, teeth striolate, with a narrow median furrow; calyptra cucullate, naked or sparsely pilose.

122. Genus LEUCOMIUM Mitt.

Leucomium MITT., Journ. Linn. Soc. Bot. (1868) 25.

Plants with the characters of the family.

LEUCOMIUM ANEURODICTYON (C. M.) Jaeg. Plate 25, fig. 151.

Leucomium aneurodictyon (C. M.) JAEG., Adumbr. 2 (1877–1878) 539.
Hypnum aneurodictyon C. M., Syn. 2 (1851) 691.
Leucomium philippinense BROTH., Philip. Journ. Sci. 8 C 8 (1913) 91.

Synoicous and autoicous; slender soft plants, pale green, slightly glossy. Stems very flat, branches blunt. Leaves complanate, lateral rows spreading, ovate-lanceolate, gradually long, filiform acuminate, to 2 mm long, entire, ecostate; cells large, lax and delicate, smooth, to 25 μ wide and 4 to 7 times as long, narrowly elliptic-rhomboidal. Seta slender, about 1 cm long, curved and minutely scabrous at tip; capsule horizontal; lid as long or longer than urn, finely beaked; calyptra naked.

LUZON, Laguna Province, Caluan, *McGregor 12517;* Mount Maquiling, *Bartlett 15722.* MINDANAO, Lanao Province, Pugoan Hill, *Bartlett 15932.*

Distribution: Ceylon, Malaysia, New Caledonia, Fiji, Samoa, Marquesas.

Usually on rotten wood. *L. philippinense* proves to be synoicous and not dioicous as described. The leaves are more slenderly acuminate than Fleischer's figures indicate, but this is a variable factor as shown by the plate in the Bryologia Javanica. In view of these facts I doubt if *L. philippinense* can be segregated from the widely spread *L. aneurodictyon* which, in all probability, also includes *Hookeria debilis* Sull.

33. Family HYPOPTERYGIACEÆ

Gregarious plants with creeping primary stems and erect, more or less branched secondary stems, often with clusters of brood filaments in upper leaf axils. Leaves dimorphous, lateral rows complanate, ovate, asymmetrical, serrate, narrowly bordered; costa single, ending in blade or percurrent; cells hexagonal, smooth; ventral row (amphigastria) smaller, acuminate. Capsules exserted, erect or pendulous; peristome double, teeth papillose or striolate, with a zigzag median line; lid rostrate; calyptra cucullate or conical, naked.

Key to the genera of Hypopterygiaceæ.

Secondary stems branched, frondose or plumose, peristome teeth striolate. 123. *Hypopterygium.*
Secondary stems simple, caudate at tips, peristome teeth papillose. 124. *Cyathophorella.*

123. Genus HYPOPTERYGIUM Brid.

Hypopterygium BRID., Bryol. Univ. 2 (1827) 709.

Primary stems creeping, densely tomentose. Secondary stems frondose or plumose, horizontal or erect, more or less flaccid and usually copiously branched. Lateral leaves in 2 rows, strongly complanate, bordered; costa single, to or beyond midleaf; cells hexagonal, smooth; amphigastria smaller. Seta smooth, usually elongate; capsule pendulous; peristome teeth transversely striolate.

Key to the species of Hypopterygium.

1. Costa of branch leaves percurrent or excurrent .... 2.
   Costa of branch leaves ending about midleaf .... 3.
2. Branch leaves bordered all around .... 1. *H. javanicum.*
   Branch leaves bordered only on under side .... 2. *H. trichocladon.*
3. Branch leaves not crowded, with abundant filiform propagula .... 4.
   Branch leaves crowded, propagula none or scarce .... 5.
4. Robust plants, stems to 4 cm high .... 3. *H. Vriesei.*
   Small plants, stems less than 2 cm high .... 4. *H. nematosum.*
5. Leaves short-acuminate .... 5. *H. ceylanicum.*
   Leaves subulate-acuminate .... 6. *H. delicatulum.*

1. HYPOPTERYGIUM JAVANICUM (Hampe) Jaeg. Plate 21, fig. 352.

Hypopterygium javanicum (Hampe) JAEG., Adumbr. 2 (1874–1875) 66.

Lepidium javanicum HAMPE, Linnæa (1874) 672.

Dioicous; primary stems creeping, secondary stems scattered, pale olive green, without lustre, densely bipinnate in an elongate, plumose frond, branched nearly to base, up to 12 cm long but usually shorter. Stem leaves widely spreading, ovate-lanceolate from a broad, slightly clasping base, acuminate, 2 to 2.5 mm long, bordered all around with 2 or 3 rows of elongate cells, distantly denticulate in upper half, slightly arched with deflexed, contorted points when dry; branch leaves smaller, oblong-lanceolate, asymmetrical, costa percurrent or short-excurrent, cells rounded, hexagonal, angular, smooth, 6 to 10 µ, larger, incrassate and porose toward base. Amphigastria less than 1 mm long, ovate-lanceolate, subulate-acuminate, costa excurrent. Sporophyte unknown.

LUZON, Benguet Subprovince, Baguio, *Williams 1682;* Pauai, *McGregor 8701;* Mount Santo Tomas, *Hadden 138.* MINDANAO, Davao Province, Mount Apo, *Weber 1476a, Elmer 11409, Williams 2657;* Lanao Province, Palao Amopo, *Bartlett 15942.*

Distribution: Nilghiri, Ceylon, Malay Peninsula, Sumatra, Java, New Guinea, New Caledonia.

On bark of trees in damp mountain forests. In this and the following species the slender habit and long, plumose fronds are in bold contrast to the short fanlike fronds of the other species. The local collections vary considerably in size and are by no means sharply distinguished from *H. trichocladon.*

2. **HYPOPTERYGIUM TRICHOCLADON** Bryol. Jav. Plate 21, fig. 353.

Hypopterygium trichocladon Bryol. Jav., Bryol. Jav. 2 (1861) 9.

Secondary stems shorter and slenderer than in *H. javanicum.* Branch leaves less strongly and uniformly bordered, border often only partially developed on the broader side of leaf and seldom produced to apex.

LUZON, Laguna Province, Mount Banahao, *Robinson 9804;* Benguet Subprovince, Mount Data, *Hadden 139;* Cagayan Province, Mount Babatugin, *Edaño 79805.* PALAWAN, Mount Mantalingahan, *Edaño 80840.*

Distribution: Java, Sumatra, Moluccas.

On trees.

3. **HYPOPTERYGIUM VRIESEI** Bryol. Jav. Plate 21, fig. 354.

Hypopterygium Vriesei Bryol. Jav., Bryol. Jav. 2 (1861) 11.

Dioicous; secondary stems scattered, dull green, branched nearly to base in a broad, fanlike frond, to 4 cm long and about 2 cm wide, branches mostly simple, laxly foliate, complanate. Lower leaves minute, scattered; stem leaves ovate, short-acuminate, very asymmetrical, 2.5 mm long, narrowly bordered all around with 2 rows of elongated cells, serrate in upper half; costa slender, ending near midleaf; cells oval-hexagonal, smooth, 16 to 18 μ wide and 2 to 3 times as long; branch leaves similar but smaller, with conspicuous clusters of brown, forked, brood filaments in axils. Amphigastria about 1 mm long, broadly ovate, abruptly short-acuminate.

LUZON, Tayabas Province, Siniloan Trail, *Robinson 9477.* MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15878a.*

Distribution: Sumatra, Java, Amboina, New Guinea, Ceram.

On wet rocks. Well distinguished by the abundant axillary brood filaments on the branches.

4. **HYPOPTERYGIUM NEMATOSUM** C. M.

Hypopterygium nematosum C. M., Flora 82 (1896) 456.

Smaller than *H. Vriesei.* Secondary stems less than 2 cm high. Leaves bordered with a single row of elongated cells.

LUZON ?

Distribution: New Guinea.

This species is credited to Luzon by Brotherus.[7] I have seen no local specimen. The original description indicates a smaller plant than *H. Vriesei*, but apart from this there are no very distinctive characters.

3. HYPOPTERYGIUM CEYLANICUM Mitt. Plate 21, fig. 155.

Hypopterygium ceylanicum MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 148.

Synoicous and autoicous; small, flaccid plants, dull yellowish green. Secondary stems erect, to 3 cm high, densely branched above in a short, broad, frond, more or less tomentose toward base of stipe. Stipe leaves small, scattered, spreading. Stem leaves broadly ovate, asymmetrical, abruptly short-acuminate, to 2 mm long and 1.5 mm wide, narrowly bordered with 2 rows of elongated cells distantly denticulate toward apex; costa ending near midleaf; cells oval-hexagonal, 15 to 20 μ wide. Branch leaves smaller, more sharply serrulate, especially on broader side. Amphigastria broadly ovate, abruptly acuminate; costa nearly obsolete. Seta about 1 cm long, curved at tip; capsule short-ovoid; lid slenderly beaked, about as long as urn; peristome teeth yellowish, striolate.

LUZON, Benguet Subprovince, Baguio, *Williams 1879*: Bontoc Subprovince, *Vanoverbergh 767*, *3953*. MINDORO, Puerto Galera, *Bartlett 13868*.

Distribution: Ceylon, Sumatra, Java, New Guinea.

On logs and damp rocks.

4. HYPOPTERYGIUM DELICATULUM Broth. Plate 21, fig. 156.

Hypopterygium delicatulum BROTH., Leafl. Philip. Bot. 2 (1909) 650.

Synoicous; slender, delicate plant in soft, lax tufts, dull yellowish green. Secondary stems 2 to 2.5 cm long, usually tomentose near base, densely branched above in a short, broad frond. Stem leaves broadly ovate, asymmetrical, 1.5 mm long and 1 mm wide, rather abruptly contracted to an entire, subulate point about 0.4 mm long, bordered all around with 1 or 2 rows of elongated cells, entire or faintly denticulate toward apex; costa stout, extending about ¾ up the leaf; cells oval-hexagonal, 12 to 15 μ wide and about twice as long. Branch leaves smaller, more strongly toothed above, slightly arched with deflexed points when dry. Amphigastria suborbicular, long subulate-acuminate, strongly bordered, entire; costa stout, often ending in the subula. Sporophyte unknown.

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[7] Pflanzenfamilien ed. 2 11 (1925) 274.

NEGROS, Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 10386*.

Endemic.

On rotten log. Slenderer than *H. ceylanicum* and quite distinct in the subulate-acuminate leaf points.

124. Genus CYATHOPHORELLA (Broth.) Fleisch.

Cyathophorella (Broth.) FLEISCH., Laubmfl. Java 3 (1908) 1088.

Cyathophorum § 1 *Cyathophorella* BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1907) 966.

Dioicous; dull-green plants in lax tufts. Primary stems rhizomatous, densely tomentose. Secondary stems simple or forked, laxly foliate, tips caudate and often densely felted with abundant brood filaments. Leaves in two rows, asymmetrical, widely spreading, smaller toward base and tip, ovate, acuminate, narrowly bordered, more or less toothed; costa short, single or forked; cells oval-hexagonal, smooth. Amphigastria smaller, symmetrical, in one row on dorsal side with axis parallel with stem. Setæ short; capsule erect, peristome teeth papillose, segments of endostome from a low basal membrane.

Key to the species of Cyathophorella.

1. Leaf margins weakly toothed .... 2.
   Leaf margins spinose-serrate .... 3.
2. Delicate plants, amphigastria ecostate .... 3. *C. aristifolia.*
   Coarse plants, amphigastria often costate .... 4. *C. Hookeriana.*
3. Leaves broadly ovate, amphigastria rounded .... 1. *C. spinosa.*
   Leaves narrowly ovate, amphigastria narrower .... 2. *C. Adiantum.*

1. CYATHOPHORELLA SPINOSA (C. M.) Fleisch. Plate 21, fig. 157.

Cyathophorella spinosa (C. M.) FLEISCH., Laubmfl. Java 3 (1908) 109.

Hookeria spinosa C. M., Syn. 2 (1851) 677.

Robust plants. Secondary stems to 6 cm long, simple, caudate tips, up to 12 mm wide with leaves, frequently with conspicuous clusters of orange-red brood filaments. Leaves widely spreading, asymmetrical, broadly ovate, short-acuminate, to 7 mm long and 3 mm wide, spinose-serrate in upper third with long, multicellular teeth; costa short, single or forked; cells oval-hexagonal, thin-walled, narrower at margins, forming an inconspicuous border. Amphigastria broad, rounded-ovate, distantly spinose above; costa short, unequally forked.

MINDORO, vicinity of Puerto Galera, at and near summit of Mount Alengyaban, near Kalayaan, *Bartlett 13694*.

Distribution: Java, Moluccas, New Hebrides, New Guinea.

On tree trunk. More robust than *C. Adiantum* with broader, short-pointed leaves and more strongly toothed amphigastria.

2. **CYATHOPHORELLA ADIANTUM** (Griff.) Fleisch. Plate 21, fig. 353.

Cyathophorella adiantum (Griff.) FLEISCH., Laubmfl. Java 4 (1908) 1094.

Neckera adiantum GRIFF., Ic. Pl. Asiat. 2 (1849) *pl. 85, fig. 2*.

Cyathophorella adianthoides BROTH., Philip. Journ. Sci. § C 8 (1913) 84.

Secondary stems slender, laxly tufted, usually simple, 8 to 10 mm wide with leaves, not tomentose, caudate at tips and often densely felted here with clusters of orange-red brood filaments. Leaves widely spreading, with points more or less decurved, oblong-ovate, acuminate, to 6 mm long; margins spinose-serrate above, teeth often composed of 2 or 3 cells; costa short, forked; cells oval-hexagonal, densely chlorophyllose above, marginal rows narrower, laxer and pellucid below. Amphigastria ovate, acuminate, symmetrical, denticulate; costa very short, forked. Sporophyte not seen.

LUZON, Benguet Subprovince, Baguio, *Williams 1672*; Rizal Province, Mount Susong-Dalaga, *Ramos 13642*.

Distribution: Himalayas.

On trees and stems in damp places. The distinctions credited to *C. adianthoides* seem to be of slight value, and I believe it can safely be merged with *C. adiantum*.

3. **CYATHOPHORELLA ARISTIFOLIA** Bartram sp. nov. Plate 21, fig. 354.

Sat humile, gregarie crescens, pallide viride. Caules secundarii 1 ad 2.5 cm alti, cum foliis 5 ad 6 mm lati, laxiuscule foliosi. Folia sicca plus minusve contracta, patula, ovato-lanceolata, raptim in subulam aristiformem attenuata, superne integra vel minute dentata, anguste limbata; costa brevis, furcatus; cellulae late ovali hexagonae. Amphigastria minuta, ecostata, elimbata.

Secondary stems relatively short, delicate, 1 to 2.5 cm long and 5 to 6 mm wide with leaves, laxly foliate, simple, rarely forked above. Leaves slightly shrunken and well spaced when dry, flat when moist, horizontally spreading, ovate-lanceolate, abruptly narrowed to an aristate point, 3 mm long and 1 mm wide, entire or with a few small distant teeth on the convex margin toward apex; costa very short, forked; cells broadly oval-hexagonal, to 20 μ wide and 2 to 2.5 times as long, narrowly rhomboidal in 2 rows at margins forming a narrow, indistinct border ending well below acumen. Amphigastria small, ovate, ecostate, aristate-pointed. Sporophyte unknown.

MINDORO, vicinity of Puerto Galera, Mount Malasimbo, *Bartlett 13851*.

Endemic.

A smaller, much more delicate plant than *C. Hookeriana*. The amphigastria are uniformly ecostate; the leaves more weakly toothed or entire; the leaf border less conspicuous and the leaf cells consistently broader. It is probably close to *C. tenera* as illustrated in the Bryologia Javanica, plate 136, but appears to be perfectly distinct in the long-aristate leaf points and more entire upper margins.

4. CYATHOPHORELLA HOOKERIANA (Griff.) Fleisch. Plate 21, fig. 350.

Cyathophorella Hookeriana (Griff.) FLEISCH., Laubmfl. Java 3 (1908) 1094.

Neckera Hookeriana GRIFF., Ic. Pl. Asiat. 2 (1849) *pl. 84, fig. 2a*.

Cyathophorum (Cyathophorella) philippinense BROTH., Leafl. Philip. Bot. 2 (1909) 657.

Dioicous; secondary stem to 4 cm long and 7 to 8 mm wide with leaves, densely foliate, caudate at tips, usually simple but occasionally dichotomously branched above, tomentose toward base. Leaves gradually decreasing in size toward tips, widely spreading, ovate-lanceolate, quickly narrowed to a long-aristate point, narrowly bordered with several rows of elongated cells, distantly and irregularly serrate above; costa forked, ending below midleaf; cells oval-hexagonal, larger and laxer toward base. Amphigastria small, unbordered; costa variable, none or produced nearly to midleaf. Perichætium small; seta 3 to 4 mm long, slightly curved; capsule inclined, cylindric, urn 3 mm long; peristome teeth narrow, brownish, densely papillose, segments of endostome as wide as teeth, carinate, papillose, from a low basal membrane; lid conic-rostrate, 2 mm long; calyptra short, mitriform, not reaching base of lid, scabrous above.

LUZON, Benguet Subprovince, Baguio, *Elmer 8544*, *Williams 1671*.

Distribution: Himalayas.

The plants referred to *C. philippinense* have the amphigastria mostly ecostate, but occasionally the costa is well developed and extended nearly to midleaf. Otherwise the plants agree perfectly with *C. Hookeriana* and I believe they can be included here.

34. Family FABRONIACEÆ

Slender, delicate plants, forming thin mats on the bark of trees and on rocks. Stems creeping, irregularly branched, branches often ascending. Leaves ovate, usually long-acuminate; costa single, slender, ending in the blade; cells rhomboidal, smooth, often lax, quadrate toward basal angles. Capsule exerted, erect; peristome single or double; lid convex and apiculate or conical; calyptra small, cucullate, usually naked.

Key to the genera of Fabroniaceæ

1. Peristome single, teeth in 8 pairs .... 125. *Fabronia.*
   Peristome double .... 2.
2. Leaves with long, capillary hairpoints........ 126. *Merrilliobryum.*
   Leaves broadly acuminate .... 127. *MacGregorella.*

125. Genus FABRONIA Raddi

Fabronia RADDI, Atti Acad. Sci. Siena 9 (1808) 230.

Very slender, delicate, microscopic plants growing in thin mats. Stems creeping, densely branched, branches ascending. Leaves minute, spreading on all sides, ovate-lanceolate, long-acuminate, finely toothed above; costa single, slender; upper leaf cells rhomboidal, quadrate in several rows at basal angles. Seta short, slender; capsule erect, minute; peristome single, teeth in 8 pairs, inserted below rim, endostome none; lid conical, short.

FABRONIA CURVIROSTRIS Doz. and Molk. Plate 21, fig. 267.

Fabronia curvirostris DOZ. & MOLK., Ann. Sci. Nat. 2 (1844) 304.

Autoicous; very slender, glossy, yellowish-green plants in intricate, silky mats. Stems creeping, densely branched, branches to 5 mm long. Leaves minute, appressed with flexuose points when dry, erect-spreading when moist, ovate-lanceolate, concave, long-acuminate, to 0.7 mm long; margins sharply denticulate by projecting cells in upper two-thirds; costa faint, ending above midleaf; upper cells rhomboidal, 6 to 8 μ wide and 4 to 6 times as long, smaller at margins, quadrate at basal angles to costa and extending obliquely up margins. Perichætium radiculose; seta 3 mm long, pale; capsule erect, ovoid, urn 0.6 mm long, wide-mouthed; peristome teeth paired, pale brown, blunt, papillose-striate, projecting about 125 μ above rim; lid conical, blunt, about 0.25 mm long; spores papillose, 16 to 18 μ.

LUZON, Benguet Subprovince, Bugias, *Merrill 4097*: Bontoc Subprovince, *Vanoverbergh 1296*.

Distribution: Java.

On trees and damp ledges. Although minute the plants and fruit are visible to the naked eye. The lid is short and conical, not as figured by Fleischer, but the leaves are identical with the Java plants and I think the local collections are properly referred to this species.

126. Genus MERRILLIOBRYUM Broth.

Merrilliobryum BROTH., Philip. Journ. Sci. § C 3 (1908) 25.

Slender, delicate, glossy, whitish-green plants in dense mats. Stems creeping, irregularly pinnate, branches suberect, densely foliate. Leaves erect-spreading, ovate-lanceolate, filiform-acuminate, denticulate; costa slender, ending near midleaf; cells narrowly linear-hexagonal, smooth, laxer below. Seta elongate, smooth; capsule erect, ovoid; peristome double; lid conical.

MERRILLIOBRYUM FABRONIOIDES Broth. Plate 25, fig. 362.

Merrilliobryum fabronioides BROTH., Philip. Journ. Sci. § C 3 (1908) 25.

Autoicous; very delicate, silky plants, densely matted together. Stems creeping, tomentose, pinnately branched, branches 3 to 5 mm long, curved. Leaves crowded, erect-spreading, narrowly ovate-lanceolate, gradually attenuate in a long, fine, capillary point; margins erect, distantly and minutely denticulate; costa faint, ending near midleaf; cells linear-hexagonal, 5 μ wide and 10 to 15 times as long, laxer toward base, irregularly quadrate at basal angles. Perichætial leaves filiform-acuminate; seta to 1.5 cm long, smooth; capsule relatively large, ovoid, urn 1.7 mm long; lid conical, 0.8 mm long; peristome teeth brownish, striolate, segments of endostome more or less split, from a high basal membrane; spores papillose, 25 to 30 μ.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4921* (type); Mount Pulog, *Curran, Merritt, & Zschokke 16432* in part: Bontoc Subprovince, *Vanoverbergh 1296*.

Endemic.

On trees. The long hairpointed leaves give this species a peculiar, soft, silky appearance that is quite distinctive. The plants are matted together with brown tomentum, and the relatively large, glossy capsules are conspicuous.

127. Genus MACGREGORELLA Bartram gen. nov.

Corticola, tenella. Caulis prostratus, pinnatim ramosus. Folia minuta, ovato-lanceolata, denticulata, uninervia. Seta elongata, tenuis, minute papillosa, theca turgide ovata, macrostoma; peristomium duplex, dentes brevissimi, truncati, proscessus e membrana brevissima, lineares, pallidi, papillosi, elongati; operculum conico-rostratum; calyptra cucullata, pilosa.

Slender, corticolous plants. Stems prostrate, pinnately branched. Leaves minute, ovate-lanceolate; costa single, short; cells rhomboidal. Seta elongate; capsule erect; peristome double, segments of endostome much longer than the very short, blunt teeth; calyptra cucullate, pilose.

MACGREGORELLA PHILIPPINENSIS Bartram sp. nov. Plate 21, fig. 161.

Autoica, tenella, laxe caespitosa. Caulis ad 2 cm longus, pinnatim ramosus, ramis curvatis, adscendentibus, ad 4 mm longis. Folia ovato-lanceolata, late acuminata, concava, denticulata, circa 0.5 mm longa, sicca adpressa; costa ad medium folii producta, cellulae superiores, rhomboideae, minute papillosae, alares numerosae, transverse ellipticae. Folia perichaetialia longe acuminata; seta 4 ad 5 mm longa, tenuis, minute papillosa; theca erecta, turgide ovata, 0.8 mm longa; peristomii dentes brevissimi, truncati, 25 ad 35 μ alti, processus elongati, lanceolato-lineari, circa 160 μ longi, irregulariter fissi; operculum conico-rostratum; calyptra cucullata, pilosa.

Autoicous; slender, dull, brownish-green plants, in lax, thin mats. Stems creeping, to 2 cm long, radiculose, wiry, pinnately branched, branches to 4 mm long, curved, ascending, terete when dry. Leaves appressed when dry, erect-spreading when moist, about 0.5 mm long, ovate-lanceolate, concave, rather broadly acuminate; costa single, ending slightly above midleaf; cells linear-rhomboidal, 5 μ wide and 4 to 5 times as long, more or less opaque, minutely papillose at apical angles, transversely oval or rounded in several rows at basal angles. Perichætial leaves slenderly acuminate; seta 4 to 5 mm long, reddish, minutely scabrous; capsule erect, short-ovoid, urn 0.8 mm long; peristome teeth very short, truncate at top, projecting 25 to 35 μ above rim, pale, papillose, segments of endostome linear-lanceolate, more or less irregularly split, about 160 μ long, from a low basal membrane; lid slenderly beaked from a conical base, 0.5 mm long; calyptra cucullate, sparingly pilose; spores papillose, 16 to 18 μ.

LUZON, Nueva Vizcaya Province, Dupax, *McGregor 20225*. Endemic.

A very curious little plant, evidently referable to section Helicodontioideæ. It is distinct from *Austinia* in the double peristome and from all the affiliated genera in the short, rudimentary peristome teeth.

35. Family LESKEACEÆ

Usually slender plants, without lustre, growing in lax or dense mats. Stems creeping, irregularly branched, branches curved and ascending, often with paraphyllia. Leaves uniform, ovate; costa single, strong, ending near apex; cells short, parenchymatous, usually more or less papillose. Seta elongate, smooth; capsule erect or horizontal; peristome double; lid conical, short; calyptra cucullate.

128. Genus PSEUDOLESKEOPSIS Broth.

Pseudoleskeopsis BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1907) 1002.

Autoicous; rather robust plants, densely tufted. Stems creeping, closely branched, branches usually simple and blunt, paraphyllia sparse. Leaves crowded, laxly spreading and slightly contorted when dry, ovate, broadly acuminate, usually blunt at tip; costa stout, ending just below apex; cells small, oval-rhomboidal, more or less papillose. Seta smooth; capsule nodding or horizontal; peristome teeth striolate, endostome with segments and cilia.

PSEUDOLESKEOPSIS DECURVATA (Mitt.) Broth. Plate 21, fig. 344.

Pseudoleskeopsis decurvata (Mitt.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1907) 1003.

Leskea decurvata MITT., Journ. Linn. Soc. Bot. 8 (1864) 154.

Pseudoleskeopsis acutissima BROTH., Philip. Journ. Sci. § C 13 (1918) 214.

Relatively robust plants, dull yellowish green at tips, brown below. Stems creeping, branches crowded, ascending, to 2 cm long, flexuose, blunt, densely foliate. Leaves indistinctly secund when dry, widely spreading when moist, about 1 mm long and 0.7 mm wide, slightly concave, broadly acuminate, usually bluntly rounded but occasionally acute; margins plane, closely serrulate toward apex; cells small, dense, more or less opaque, 4 to 5 μ wide and 2 to 3 times as long, minutely papillose, more elongate near costa at extreme base, subrectangular at basal angles; costa 225 μ wide below, ending just below apex. Perichætial leaves costate, subulate-acuminate; seta to 2 cm long, reddish; capsule inclined or horizontal, urn 2 mm long, slightly curved; annulus broad; lid broadly conical; segments of endostome carinate, from a high basal membrane, cilia 1 to 3, nodose; spores 10 to 15 μ.

LUZON, Benguet Subprovince, Baguio, *Williams*: Rizal Province, *Foxworthy 51, 72*: Nueva Vizcaya Province, vicinity of Dupax, *McGregor 14346*: Bataan Province, *Curran 6534*: Camarines Sur Province, Botol River, *Edaño 84266*.

On wet rocks. The leaves in *P. acutissima* are not uniformly acute and in many instances are inseparable from those of *P. decurvata*. Without any other correlating characters I doubt if this is anything more than a slight form with some of the leaves more sharply pointed than usual.

P. Zippelii (C.M.) Broth. is separated from our species principally by the weakly nerved parichætial leaves.[3] I have not been able to confirm this distinction, but the character is hardly a weighty one and the name *P. Zippelii* will probably eventually be used in an inclusive sense for the local plants.

36. Family THUIDIACEÆ

Slender or robust plants without lustre. Stems copiously branched, often regularly 2- or 3-pinnate, usually with paraphyllia. Leaves often dimorphous, branch leaves smaller and well differentiated, ovate, concave, short-pointed; costa single, stout; cells small, rounded, papillose. Seta elongate, smooth, rarely papillose; capsules mostly horizontal, seldom erect, peristome double, perfect, hypnoid in structure; lid conic-rostrate; calyptra usually naked, rarely pilose or hispid.

Key to the genera of Thuidiaceæ.

1. Stem and branch leaves similar, not well differentiated, 129. *Claopodium*.
   Stem and branch leaves well differentiated.. 2.
2. Calyptra campanulate, hispid.. 130. *Pelekium*.
   Calyptra cucullate, mostly naked .... 131. *Thuidium*.

129. Genus CLAOPODIUM (Lesq. and James) Ren. and Card.

Claopodium (Lesq. & James) REN. & CARD., Musc. Am. Sept. (1893) 60.

Hypnum Subgen. *Claopodium* LESQ. & JAMES, Manual (1884) 327.

Slender, rupestrine plants in thin mats. Stems prostrate, more or less irregularly pinnate, paraphyllia minute or none, branches ascending. Stem and branch leaves very similar, ovate, slenderly acuminate, serrulate; costa stout, usually percurrent or short-excurrent; cells oval-hexagonal, papillose. Seta smooth or papillose; capsule inclined; peristome double, perfect; calyptra cucullate, naked.

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[3] Thériot, Le Genre Pseudoleskeopsis. Ann. de Crypt. Exot. 2 (1929) 5–22.

CLAOPODIUM NERVOSUM (Harv.) Fleisch. Plate 21, fig. 365.

Claopodium nervosum (Harv.) FLEISCH., Laubmfl. Java 4 (1922) 1504.
Hypnum nervosum HARV., Lond. Journ. Bot. (1840) 21.
Hypnum prionophyllum C. M., Syn. 2 (1851) 431.

Dioicous; slender plants in thin mats, yellowish green above, brown below. Stems tough and wiry, prostrate, densely branched. Leaves laxly imbricated, contorted when dry, up to 1 mm long, narrowly ovate-lanceolate, long and slenderly acuminate, denticulate all around; costa strong, brownish, excurrent; cells oval-hexagonal, irregular, about twice as long as wide, with a single papilla over lumen, marginal row usually larger, rhomboidal, pellucid. Branch leaves similar but somewhat smaller, with shorter cells. Seta 10 to 12 mm long, smooth; capsule inclined, oblong-cylindric; lid with a slender, oblique beak; peristome teeth striolate, segments of endostome more or less split, from a high basal membrane, cilia nodulose.

BATAN, Mount Iraya, *Bartlett 15467, 15470*. LUZON, Benguet Subprovince, Baguio, *Williams 1837*; Nueva Ecija Province, Bongabong, *Santos 189*; Laguna Province, Mount Maquiling, *Bartlett 15802, 15805, Baker 7010a*. MINDORO, Puerto Galera, *Bartlett 13622, 13359, 13378*. MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15876, 15879, 15881, 15884, 15931*.

Distribution: Himalayas, Ceylon, Sumatra, Java, Celebes, China, Korea, Japan.

On rocks. Easily recognized by the slender, wiry stems and the small undifferentiated stem and branch leaves with sharply toothed margins and opaque, strongly papillose cells.

The collections from Batan Island are not entirely typical. The leaf cells are more highly papillose with sharper, spinelike papillæ, and the marginal row scarcely differentiated. This form will bear watching and may prove to be allied to some of the Japanese species.

130. Genus PELEKIUM Mitt.

Pelekium MITT., Journ. Linn. Soc. Bot. (1869) 176.

Very slender, laxly tufted plants without lustre. Stems elongate, creeping, regularly bipinnate, paraphyllia abundant. Stem leaves distant, filiform-acuminate; branch leaves ovate, concave, blunt, crenulate; costa pectinate on back; cells strongly papillose. Perichætium large, inner leaves toothed, long subulate-acuminate; seta elongate, densely setose; capsule horizontal, ovoid, turgid; lid long-beaked; peristome as in *Thuidium*; calyptra campanulate, hispid, lobed at base.

Key to the species of Pelekium.

Autoicous, branch leaves rounded .... 1. *P. velatum.*
Dioicous, branch leaves oblong .... 2. *P. bifarium.*

1. **PELEKIUM VELATUM** Mitt. Plate 21, fig. 316.

Pelekium velatum Mitt., Journ. Linn. Soc. Bot. (1869) 176.

Autoicous; very delicate, wiry plants, dull yellowish green, in lax mats. Stems elongate, creeping, radiculose and paraphyllose, distantly and regularly bipinnate, primary branches horizontally spreading, 4 to 5 mm long. Stem leaves erect-spreading, abruptly filiform-acuminate from a broad, cordate base, to 0.7 mm long; margins recurved; costa ending in the point. Branch leaves smaller, broadly ovate, short pointed, asymmetrically divided by costa, about 0.2 mm long on ultimate branches, carinate, strongly toothed all around; costa ending below apex; cells quadrate-hexagonal, strongly unipapillate, 5 to 8 μ wide. Perichætium large, inner leaves irregularly erose-denticulate, very long-aristate; seta to 1.5 cm long, setulose, curved at tip; capsule horizontal or pendulous, short-ovoid, urn 1.5 mm long; lid with a long, slender beak; calyptra large, campanulate, strongly hispid, lobed at base; peristome normal.

Numerous representative collections from nearly all the larger islands.

Distribution: Malay Peninsula, Siam, wide in Malaysia, Pacific islands to Samoa.

On logs and dead wood, common. A delicate, lacy little moss with wiry, trim, bipinnate branches very regularly arranged. It fruits abundantly and may be recognized by the rough setæ and large, bell-shaped, hispid calyptræ.

2. **PELEKIUM BIFARIUM** (Bryol. Jav.) Fleisch. Plate 21, fig. 317.

Pelekium bifarium (Bryol. Jav.) Fleisch., Laubmfl. Java 4 (1922) 1513.

Thuidium bifarium Bryol. Jav., Bryol. Jav. 2 (1865) 123.

Dioicous; plants with the habit of *P. velatum* but slightly larger. Branches less regularly pinnate and laxer. Branch leaves laterally spreading in 2 rows, oblong-ovate, bluntly pointed, 0.3 to 0.4 mm long on the ultimate branches. Sporophyte similar to that of *P. velatum* but with a smaller, less strongly hispid calyptra.

LUZON, Bulacan Province, Kay Tianak, *Bartlett 14099*. MINDORO, Puerto Galera, *Bartlett 13678*. PANAY, Iloilo Province, Salug River, *Robinson 18009, 18101, 18104, 18107, 18158*.

Distribution: Sumatra, Java, Amboina.

On sandstone. Slightly larger than *P. velatum* and more irregularly bipinnate. The ultimate branch leaves are larger and decidedly more oblong in outline. No fruiting plants have been found in the Philippines so far.

131. Genus THUIDIUM Br. and Schimp.

Thuidium Br. & SCHIMP., Bry. Eur. fasc. 49 to 51 (1852).

Slender or robust plants without lustre, growing in flat, feathery mats. Stems creeping, bipinnate and tripinnate, with abundant paraphyllia. Leaves dimorphous; stem leaves larger, from a broad, cordate base, long-acuminate; branch leaves small, ovate, concave, short pointed, costa single, cells rounded, papillose; capsule usually inclined or horizontal; lid beaked; peristome double, perfect; calypitra cucullate, mostly naked.

Key to the species of Thuidium.

1. Autoicous, delicate plants, paraphyllia few, small .... 2.
Dioicous, coarser plants, paraphyllia abundant, coarse .... 6.
2. Seta smooth .... 1. *T. tamariscellum.*
Seta scabrous above or throughout .... 3.
3. Seta smooth below, branch leaves about 0.15 mm long .... 4.
Seta scabrous throughout, branch leaves longer .... 5.
4. Seta about 1 cm long .... 2. *T. investe.*
Seta 2.5 to 3 cm long .... 3. *T. benguetense.*
5. Calyptra pilose, branch leaves about 0.4 mm long .... 4. *T. kiasense.*
Calyptra glabrous, branch leaves about 0.2 mm long.. 5. *T. Meyenianum.*
6. Seta scabrous, stems very regularly bipinnate .... 6. *T. plumulosum.*
Seta smooth, stems irregularly bi- or tripinnate .... 7.
7. Stem leaves with long, capillary points, perichætial leaves ciliate.
9. *T. cymbifolium.*
Stem leaves short-acuminate, costa ending below apex, perichætial leaves not ciliate .... 8.
8. Papillæ of branch leaves stellate at apex .... 7. *T. glaucinum.*
Papillæ of branch leaves simple, curved .... 8. *T. glaucinoides.*

1. **THUIDIUM TAMARISCELLUM** (C. M.) Bryol. Jav. Plate 11, fig. 183.

Thuidium tamariscellum (C. M.) Bryol Jav., Bryol. Jav. 2 (1865) 120.

Hypnum tamariscellum C. M., Bot Zeit. (1854) 573.

Autoicous: exceedingly delicate plants in lax, thing mats, dull brownish green. Stems creeping, radiculose, irregularly bipinnate, paraphyllia few, mostly simple. Stem leaves distant, acuminate from a broad, cordate-ovate base, 0.6 mm long; branch leaves ovate-lanceolate, broadly acuminate, carinate, scarcely 0.2 mm long on ultimate branches; costa ending below apex; cells rounded, pluripapillate, 7 µ wide. Perichætial leaves entire, long-acuminate; seta 12 mm long, smooth, curved at tip; capsule ovoid-cylindric, inclined, contracted under mouth; lid conical, long-beaked; peristome normal.

LUZON, Benguet Subprovince, Baguio, *Williams 1848:* Bontoc Subprovince, *Vanoverbergh 396.*

Distribution: Nilghiri, Tonkin, Sumatra, Java.

On trees. Distinguished from all the other minute species by the smooth setæ.

1. THUIDIUM INVESTE (Mitt.) Jaeg. Plate 21, fig. 309.

Thuidium investe (Mitt.) JAEG., Adumbr. 2 (1876–1877) 318.
Hypnum investe MITT., Hook. Journ. Bot. (1856) 255.
Leskea investis MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 135.

Autoicous; very small, delicate plants in thin, brownish-green mats. Stems creeping, bipinnate, with scattered, small paraphyllia, ultimate branches capillary. Stem leaves distant, ovate, short-acuminate; branch leaves smaller, ovate, blunt, incurved when dry, 0.1 to 0.15 mm long on ultimate branches; costa ending below apex; margins crenulate; cells pluripapillate. Perichætial leaves denticulate; seta about 1 cm long, smooth below, scabrous above; capsule relatively large, horizontal, urn 1 mm long; peristome normal; lid long and slenderly beaked.

LUZON, Rizal Province, Mount Lumutan, *Ramos & Edaño 29821:* Benguet Subprovince, Twin Peaks, Benguet Road, *Williams 1844:* Laguna Province, Mount Maquiling, *Bartlett 15640, 15654, 15670, 15678.* PANAY, Iloilo Province, *Robinson 18180.*

Distribution. Burma.

On rocks. These plants are so delicate that the leaves are scarcely visible to the naked eye. Under a microscope the setæ are slightly papillose toward the apex.

4. THUIDIUM BENGUETENSE Broth. Plate 22, fig. 310.

Thuidium benguetense BROTH. in herb.

Autoicum. *T. investe* habitu simile. Folia caulina e basi late cordato-ovata, acuminata; folia ramea minora, ovata, acuta. Folia perichætialia denticulata; seta 2 to 2.5 cm longa, superne minute papillosa; calyptra nuda. Caetera ignota.

Autoicous; small plants, slightly larger than *T. investe*, in dense, thin, golden-brown mats. Stems creeping, bipinnate, paraphyllia rather numerous, simple. Stem leaves ovate-lanceolate from a broadly cordate base, acuminate, about 0.5 mm long; branch leaves smaller, 0.15 to 0.2 mm long on ultimate branches, ovate, acute; costa scabrous on back, ending below apex; cells strongly pluripapillate. Perichætial leaves long-acuminate, denticulate; seta 2 to 2.5 cm long, reddish, smooth below, papillose toward tip; calyptra naked.

LUZON, Benguet Subprovince, Baguio, *Elmer 8566;* Pauai, *McGregor 8659*.

Endemic.

The long setæ, smooth below, seem to distinguish this as a perfectly valid species. The sporophytes are all immature and show no developed capsules.

4. THUIDIUM KIASENSE Williams. Plate 22, fig. 371.

Thuidium kiasense WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 363.

Autoicous; small plants in thin, yellowish-green mats. Stems creeping, irregularly pinnate, branches slender, to 5 mm long, usually simple, paraphyllia small, scattered, confined to primary stems. Stem leaves 0.5 mm long, ovate-lanceolate, acuminate, costa ending in acumen; branch leaves strongly incurved and contorted when dry, oblong-ovate, acute or blunt, 0.4 to 0.5 mm long, carinate-concave, denticulate, costa ending well below apex, cells dense, obscure, rounded-hexagonal, 6 to 8 μ, with one to several small papillæ over lumens. Perichætial leaves filiform-acuminate, serrulate; seta 5 to 6 mm long, papillose throughout; capsule ovoid-cylindric, inclined, urn 0.75 mm long; lid slenderly beaked; peristome normal; calyptra narrow, cucullate, sparingly pilose.

LUZON, Benguet Subprovince, Benguet Road, Kias Hill, *Williams 1834*.

Endemic.

On bark of tree. Quite distinct from *T. Meyenianum* in the once-pinnate stems, larger branch leaves, shorter setæ, and pilose calyptræ.

5. THUIDIUM MEYENIANUM (Hampe) Bryol. Jav. Plate 22, fig. 372.

Thuidium Meyenianum (Hampe) Bryol. Jav., Bryol. Jav. 2 (1865) 121.
Hypnum Meyenianum HAMPE, Ic. Musc. (1844) *pl. 8*.
Leskea trachypoda MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 131.

Autoicous; delicate, wiry plants with the habit and color of *Pelekium velatum*. Stems very regularly bipinnate, paraphyllia few and small. Stem leaves scattered, abruptly long-acuminate from a cordate-ovate base, about 0.5 mm long. Branch leaves smaller, ovate, blunt, incurved when dry, concave; costa ending below apex; cells obscure, pluripapillate. Perichætial leaves filiform-acuminate, irregularly denticulate; seta 1 to 1.5 cm long, coarsely papillose; capsule inclined, ovoid-cylindric, curved, urn 1 mm long; peristome large; calyptra cucullate, naked.

LUZON, Bontoc Subprovince, Mount Masapalid, *Ramos & Edaño 38247:* Ifugao Subprovince, Payauan, *McGregor 20044:* Benguet Subprovince, Baguio, *Williams 1839:* Bataan Province, Lamao, *Merrill 3559*, *Williams 808:* Laguna Province, Mount Maquiling, *Robinson 17212:* Zambales Province, Olongapo, *Ebalo 35, 37:* Rizal Province, Montalban, *Bartlett 14386, 14409:* Nueva Ecija Province, Bongabong, *Santos 170.* MINDANAO, Zamboanga Province, Banga, *Whitford & Hutchinson 9082, 9085.*

Distribution: Himalayas, Ceylon, Annam, Sumatra, Java, New Guinea, Solomon Islands.

On trees and damp rocks. Distinguished from all but *T. kiasense* by the setæ being coarsely papillose to the base.

4. **THUIDIUM PLUMULOSUM** (Doz. and Molk.) Bryol. Jav. Plate 72, fig. 373.

Thuidium plumulosum (Doz. & Molk.) Bryol. Jav., Bryol. Jav. 2 (1865) 118.

Hypnum plumulosum Doz. & MOLK., Ann. Sci. Nat. (1844) 208.

Dioicous; large plants in intricate mats, dull green. Stems elongate, tough and wiry, ascending or arched, very regularly and neatly bipinnate, paraphyllia dense, multiform. Stem leaves abruptly acuminate from a wide, triangular-ovate base, slightly more than 1 mm long, faintly plicate, margins recurved, costa vanishing in acumen. Branch leaves smaller, ovate, short-pointed, apical cell with 2 or 3 papillæ; cells irregularly hexagonal, with a single sharp papilla over lumen. Perichætial leaves numerous, often deeply split, with long, simple or branched, denticulate cilia on margins; seta stout, densely papillose, 2.5 to 3 cm long; capsule inclined, curved, oblong-cylindric, urn 3 mm long; peristome large, reddish; lid conic-rostrate; calyptra cucullate, densely clothed with short bristles.

LUZON, Nueva Ecija Province, Bongabong, *Santos 201:* Laguna Province, Los Baños, Mount Maquiling, *702, 760, 2382, Robinson 9661, Elmer:* Tayabas Province, Tagcauayan, *Fox-*

worthy & Ramos 19098; Baler, *Santos 269, 961*. MINDORO, Alag River, *Merrill 5680*; Puerto Galera, *Bartlett 13631, 13757*. NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 58, 102*. PALAWAN, Puerto Princesa, Mount Pulgar, *Elmer 13097*. SAMAR, Mount Cauayan, *Ramos 17620*. MINDANAO, Sax River, *Williams 2394*; Camaguin de Mindanao, *Ramos 14895*.

Distribution: Ceylon, East Indies, New Guinea, Moluccas, Fiji.

On exposed tree roots and rocks. This species fruits rather freely but may be recognized when sterile by the trim, closely branched fronds very regularly spaced along the main stem.

7. **THUIDIUM GLAUCINUM** (Mitt.) Jaeg. Plate 22, fig. 374.

Thuidium glaucinum (Mitt.) JAEG., Adumbr. 2 (1876–1877) 331.
Leskea glaucina MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 133.

Dioicous; robust plants, pale or yellowish green, in lax mats. Stems arched, regularly bipinnate, often radiculose at tips; paraphyllia numerous, filiform, branched. Stem leaves 1 to 1.5 mm long, lightly plicate, broadly acuminate from an ovate base; margins nearly plane; costa ending in base of acumen. Branch leaves smaller, ovate, deeply concave, acute; costa slender, ending below apex; cells distinct, oval-hexagonal, papillæ with stellate tips over lumens. Perichætial leaves toothed; capsule suberect (sporophyte not seen).

LUZON, Laguna Province, Mount Maquiling, *Robinson 17026, Bartlett 15777, 15780a, 15782b*. NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 6, 10, 20, 25*.

Distribution: Himalayas, southern India, Ceylon, Java, Assam, Japan.

On exposed tree roots. With careful focusing the characteristic papillæ with multifid tips are clearly demonstrated in profile and on the surface of the leaf.

8. **THUIDIUM GLAUCINOIDES** Broth. Plate 22, fig. 375.

Thuidium glaucinoides BROTH., Philip. Journ. Sci. § C 3 (1908) 26.

Dioicous; robust plants very similar to *T. glaucinum*. Stem leaves short-acuminate from a broad-ovate base, lightly plicate, margins slightly undulate and irregularly recurved, strongly crenulate, costa ending below apex. Branch leaves deeply concave; cells 7 to 8 μ in diameter, irregularly hexagonal, distinct, with a single, large, curved, spinelike papilla over lumens. Perichætial leaves loriform-acuminate, toothed but not ciliate. Sporophyte not seen.

LUZON, Rizal Province, San Isidro, *Foxworthy 43*. NEGROS, Dumaguete, *Chapman 6*.

Distribution: Burma, Tonkin, Malaysia, Formosa, China, New Hebrides, Fiji, Samoa.

On damp rocks. Although sterile the Philippine plant is quickly distinguished from *T. glaucinum* by the simple, forwardly curved papillæ of the branch leaves. The distinctions in the stem leaves are not so well marked.

1. **THUIDIUM CYMBIFOLIUM** (Doz. and Molk.) Bryol. Jav. Plate 22, fig. 174.

Thuidium cymbifolium (Doz. & Molk.) Bryol. Jav., Bryol. Jav. 2 (1865) 115.

Hypnum cymbifolium Doz. & MOLK., Ann. Sci. Nat. (1844) 306.

Hypnum casuarinum C. M., Linnaea 38 (1874) 569.

Dioicous; large plants in lax intricate mats, dark green or brownish. Stems elongate, arched and ascending, irregularly bipinnate and tripinnate, densely felted with multiform paraphyllia. Stem leaves erect-spreading, plicate, from a broad cordate-ovate base abruptly narrowed to a long capillary point formed by the excurrent costa, 2 to 3 mm long; leaves of ultimate branches much smaller, ovate, short-acuminate, apical cell with 2 or 3 papillæ, costa ending below apex, cells rounded, with a single sharp papilla over lumens. Perichætial leaves strongly ciliate in upper half; costa excurrent in a long, flexuose, capillary point; seta 3 to 4 cm long, smooth; capsule horizontal, oblong-cylindric, urn 2.5 to 3 mm long; calyptra cucullate, naked.

LUZON, numerous collections from scattered localities. NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 47*. PALAWAN, Cabinbin River, *Weber 1569*.

Distribution: wide in Malaysia, Formosa, Lord Howe Island, New Guinea, China, Japan.

Hypnum casuarinum was evidently described from plants with immature or old perichætia which may not have shown the cilia of the perichætial leaves to good advantage. I can find no plants from the Philippines with eciliate perichætial leaves, and I doubt whether *H. casuarinum* is really a distinct species.

T. cymbifolium varies considerably in color and habit but is sharply distinct in the long capillary points of the stem leaves.

37. Family BRACHYTHECIACEÆ

Slender or robust plants in lax to dense tufts or mats, usually glossy. Stems prostrate or ascending, mostly irregularly branched. Leaves erect-spreading on all sides, ovate-lanceolate, acuminate, toothed, often plicate; costa single, usually ending in the upper half of the leaf; cells elongate, smooth or papillose at apical angles. Seta elongate, smooth or papillose; capsule horizontal, seldom erect, often gibbous at back; peristome double, teeth usually striolate; lid conical or long-rostrate; calyptra small, cucullate, naked.

Key to the genera of Brachytheciaceæ.

1. Capsules erect, inner peristome rudimentary.................................. 2.
   Capsules nodding or horizontal, peristome perfect.............................. 3.
2. Basal cells short, in wide band across leaf base............ 132. *Homalothecium.*
   Inner basal cells elongate.. 133. *Pleuropus.*
3. Lid short, conical... 134. *Brachythecium.*
   Lid long and slenderly beaked... 4.
4. Coarse plants, leaves broad.................................... 135. *Eurhynchium.*
   Slender, delicate plants, leaves narrow.................... 136. *Rhynchostegiella.*

132. Genus HOMALOTHECIUM Br. and Schp.

Homalothecium Br. & Schp., Bry. Eur. fasc. 46, 47 (1851).

Rather robust plants. Stems creeping, branched, branches erect or ascending, irregularly pinnate, densely foliate. Leaves ovate-lanceolate, acuminate, plicate, serrulate all around; costa extending beyond midleaf; cells linear, differentiated in a broad band across leaf base. Seta elongate, smooth or scabrous; capsule erect, ovoid-cylindric; peristome teeth papillose, inner peristome rudimentary with segments very short or lacking; lid conic-rostrate; calyptra naked or sparingly pilose.

HOMALOTHECIUM APPRESSIFOLIUM (Williams) Broth. Plate 22, fig. 37.

Homalothecium appressifolium (Williams) Broth., E. & P. Pflanzenfam. ed. 2 11 (1925) 365.

Pleuropus appressifolius Williams, Bull. N. Y. Bot. Garden 8 (1914) 373.

Dioicous; robust pale-brown or yellowish-green plants in dense mats, slightly glossy. Stems creeping, branches erect, simple or sparingly branched, densely foliate, terete. Branch leaves erect and appressed when dry, erect-spreading when moist, to 2 mm long, ovate-lanceolate, deeply plicate, broadly acuminate, serrulate to base; costa stout, ending more than ⅔ up the leaf, often minutely toothed on back above; cells linear-rhomboidal, about 4 μ wide and 8 to 10 times as long, smooth, abruptly shorter near base, irregularly rounded and granulose in a broad band across leaf base. Perichætial leaves erect, gradually acuminate; capsule erect, ovoid-cylindric, urn 2.5 mm long; seta 1.5 to 2 cm long, smooth; annulus none; lid conic-rostrate, oblique; peristome teeth narrow, papillose, 0.3 mm long, endostome rudimentary, basal membrane about ⅓ height of teeth, papillose, irregularly eroded on edge, segments none; calyptra large, cucullate, sparingly pilose with long capillary hairs below; spores papillose, 12 to 15 µ.

LUZON, Benguet Subprovince, Baguio, *Williams 1881*, *Sanchez 8*. PANAY, Iloilo Province, Larena, *Robinson 18208*.

Endemic.

On rocks and trees. This species will be recognized at once by the terete branches and the band of short rounded cells extending clear across the leaf base. In *Pleuropus luzonensis* the inner basal cells are elongate and the leaves not at all appressed.

133. Genus PLEUROPUS Griff.

Pleuropus Griff., Not. 468; Ic. Pl. Asiat. 2 (1849) *pl. 90*.

Plants similar in habit and structure to *Homalothecium*. Leaves long and slenderly acuminate; inner basal cells elongate, at basal angles rounded-quadrate in a small group. Capsule erect, cylindric on an elongate, smooth seta; peristome teeth striolate, segments of endostome filiform, shorter than teeth.

The distinctions between *Pleuropus* and *Homalothecium* are so slight that their becoming united in a single genus seems inevitable.

PLEUROPUS LUZONENSIS Broth. Plate 27, fig. 778.

Pleuropus luzonensis BROTH., Leafl. Philip. Bot. 2 (1909) 657

Dioicous; medium-sized, glossy plants, densely tufted, yellowish green. Stems elongate, creeping, radiculose, densely branched, branches erect, mostly simple, to 2 cm long. Branch leaves crowded, erect-spreading, to 3 mm long, ovate-lanceolate from a broadly cordate base, gradually subulate-acuminate, plicate; margins reflexed near insertion, plane and serrulate above; costa slender, ending about ⅔ up the leaf near base of subula; cells linear, smooth, short and irregularly rounded at basal angles in a small group. Perichaetial leaves subulate-acuminate, denticulate; seta 10 to 12 mm long, smooth; capsule erect, ovoid-cylindric, urn 2 mm long; peristome teeth finely striolate, segments of endostome slender and fragile, from a basal membrane nearly half height of teeth; calyptra naked.

LUZON, Benguet Subprovince, Baguio, *Elmer 8451* (type), *Williams 1862*, *F. Sanchez 9*, *Fenix 12342*, *Baker 3856*, *Merrill 7861*, *Robinson 14020*; Mancayan to Baguio, *Ramos & Edaño 40595*; Mount Santo Tomas, *Bartlett 13298*.

Distribution: Java.

On rocks and trees. Apparently frequent in the vicinity of Baguio and confined to northern Luzon in the local area.

134. Genus BRACHYTHECIUM Br. and Schp.

Brachythecium BR. & SCHP., Bry. Eur. fasc. 52/54 (1853).

Medium-sized plants in intricate mats, often glossy. Stems creeping, irregularly branched. Leaves ovate-lanceolate, acuminate, often plicate; costa single, ending above midleaf; cells linear, shorter and broader below, often subquadrate at basal angles. Seta elongate, smooth or papillose; capsule short-ovoid, nodding; lid conical; peristome double, hypnoid in structure.

Key to the species of Brachythecium

Seta smooth, leaves plicate	1. *B. Buchanani.*
Seta scabrous above, leaves not plicate	2. *B. plumosum.*

1. BRACHYTHECIUM BUCHANANI (Hook.) Jaeg. Plate 12, fig. 379.

Brachythecium Buchanani (Hook.) JAEG., Adumbr. 2 (1876–1877) 407.

Hypnum Buchanani HOOK., Trans. Linn. Soc. 9 (1808) 320.

Dioicous; pale, glossy, yellowish-green plants in lax mats. Stems irregularly branched, branches slightly flattened, erect or ascending. Stem leaves erect, ovate-lanceolate, long-acuminate, entire, plicate, decurrent at basal angles, 2.5 mm long and 1.2 mm wide, branch leaves erect-spreading, slightly smaller, minutely denticulate nearly to base, plicate, long-acuminate; cells linear-rhomboidal, smooth, 6 to 8 μ wide and 8 to 10 times as long, laxer toward base, shorter and subrectangular across insertion. Perichætial leaves filiform-acuminate; seta 2 to 2.5 cm long, smooth; capsule inclined, brown, ovoid, urn 2 mm long; lid conical, 1 mm long; peristome teeth brown, finely striolate.

LUZON, Benguet Subprovince, Baguio, *Williams 1716*.

Distribution: Himalayas, Assam, China, Japan.

On rocks. Sharply distinct from the following species in the finely acuminate, plicate leaves and smooth setæ.

2. BRACHYTHECIUM PLUMOSUM (Hedw.) Br. and Schp. Plate 12, fig. 380.

Brachythecium plumosum (Hedw.) BR. & SCHP., Bry. Eur. fasc. 52/54 (1853) 537.

Hypnum plumosum HEDW., Sp. Musc. (1801) 257.

Hypnum oxyrrhynchum DOZ. & MOLK., Ann. Sci. Nat. (1844) 308.

Autoicous; robust plants in dense mats, brownish green glossy. Stems creeping, irregularly branched, branches suberect or curved. Stem leaves spreading, broadly ovate, slightly decurrent, acuminate, denticulate above; branch leaves erect-spreading, often more or less secund, ovate-lanceolate, concave, not plicate, long-acuminate, serrulate above, to 1.5 mm long; costa extending about ¾ up the leaf; cells linear, 5 to 6 μ wide and 6 to 10 times as long, abruptly shorter near insertion, subquadrate and thick-walled at basal angles. Seta to 22 mm long, dark red, papillose above, smooth below; capsule dark brown, inclined, ovoid, urn about 2 mm long; lid conical, sharply pointed, 0.8 mm long; peristome normal.

LUZON, Benguet Subprovince, Baguio, *Williams 1704, 1746;* Mount Santo Tomas, *Williams 1711:* Laguna Province, Mount Banahao, *Robinson 9780.* NEGROS, Oriental Negros Province, Canlaon Volcano, *Merrill 6823.* MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11556.*

Distribution: Cosmopolitan.

Mostly on damp rocks in stream beds. Like many plants of wide distribution this is a variable species in many ways, but the forms all fall within a single specific concept. It is notable in the smooth leaves and the setæ being smooth below and papillose above.

135. Genus EURHYNCHIUM Br. and Schp.

Eurhynchium BR. & SCHP., Bry. Eur. fasc. 57/61 (1854).

Slender or robust plants in lax or dense mats. Stems creeping, often elongate, irregularly branched. Leaves acuminate, rarely blunt; costa single to or beyond midleaf, sometimes ending in a minute spine on back; cells linear, more lax below. Seta elongate, smooth in our species; capsule horizontal, lid long and slenderly rostrate; peristome as in *Brachythecium*.

Key to the species of Eurhynchium.

1. Leaves obtuse or acute, robust subaquatic plants.................... 1. *E. Mulleri*
   Leaves acuminate .... 2.
2. Autoicous, costa faint, ending in the lamina .... 4. *E. celebicum.*
   Dioicous, costa stout, ending in a minute spine on back........................ 3.
3. Slender plants, setæ smooth .... 3. *E. vagans.*
   Larger plants, setæ scabrous.. 2. *E. asperisetum*

1. **EURHYNCHIUM MULLERI** (Bryol. Jav.) Bartram. Plate 27, fig. 381.

Eurhynchium Mulleri (Bryol. Jav.) BARTRAM, B. P. Bishop Museum Bull. 101 (1933) 214.

Hypnum Mulleri Bryol. Jav., Bryol. Jav. 2 (1867) 162.

Autoicous; robust, subaquatic plants in flat mats, lustrous yellowish green above, brown below. Stems prostrate, elongate, irregularly branched. Lower leaves mostly eroded, upper leaves crowded, spreading, more or less shrunken and striate when dry, broadly ovate, obtuse or bluntly acute, concave, to 1.8 mm long and 1.2 mm wide; margins plane, denticulate to base; costa stout below, tapering upward and ending considerably below apex; cells 6 to 8 μ wide and about 10 times as long, shorter and rhomboidal near apex, several rows across insertion short and lax. Perichætium small; seta smooth, 10 to 12 mm long; capsule slightly inclined, ovoid, urn 1.5 mm long; lid rostrate from a conical base.

LUZON, Benguet Subprovince, Pauai, *Copeland 1920*, *Merrill 6672*.

Distribution: Sumatra, Java, Hawaii.

On wet rocks.

5. **EURHYNCHIUM ASPERISETUM** (C. M.) Bartram comb. nov. Plate 22, fig. 382.

Hypnum asperisetum C. M., Bot. Zeit. (1858) 171.

Moderately large, laxly tufted, wiry plants, golden green, slightly glossy. Stems creeping or decumbent, to 6 cm long, irregularly branched, often stoloniferous, branches flattened and more or less attenuate. Stem leaves widely spreading, distant below, acuminate, weakly toothed; branch leaves complanate, broadly ovate, short-acuminate, slightly asymmetrical, 1.7 mm long, 1 mm wide, sharply serrulate nearly to base; costa stout, ending in a sharp prickle on back some distance below apex; cells linear with firm, pale walls, marginal row shorter and rhomboidal, shorter, incrassate and porose at extreme base. Seta up to 2.5 cm long, scabrous; capsule horizontal, ovoid.

MINDORO, Mount Malasimbo, vicinity of Puerto Galera, *Bartlett 13867*.

Distribution: Java.

On rocks. These plants are sterile but as far as the vegetative features are concerned they agree perfectly with *E. asperisetum*. Until fruiting plants are found the record must remain open to question.

6. **EURHYNCHIUM VAGANS** (Harv.) Bartram. Plate 22, fig. 384.

Eurhynchium vagans (Harv.) BARTRAM, B. P. Bishop Mus. Bull. 101 (1933) 213.

Hypnum vagans HARV., Hook. Ic. Pl. rar. (1841) pl. 24, *fig. 2*.

Oxyrrhynchium distantifolium WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 375.

Dioicous; slender, much-branched plants in thin, lax mats, yellowish green, glossy. Stems to 10 cm long, wiry, more or less stoloniferous, laxly foliate, branches flexuose, attenuate at tips. Stem leaves ovate-lanceolate, finely acuminate, minutely denticulate above, entire below; branch leaves often slightly larger, more or less complanate, abruptly short-acuminate, sharply serrate all around; costa stout, ending about ¾ up the leaf in a minute dorsal spine; cells linear, 5 to 6 µ wide and 12 to 15 times as long, shorter in apex and across base. Perichaetial leaves squarrose-spreading; seta smooth, to 4 cm long; capsule large, ovoid, asymmetrical, urn 2 mm long; annulus broad; lid 2 mm long, conic-rostrate with a slender, oblique beak; peristome perfect.

LUZON, Benguet Subprovince, Baguio, *Williams 1718*: Ifugao Subprovince, Mount Polis, *McGregor 19932*: Cagayan Province, Magapit, *Bartlett 14840, 14847, 14854, 14886*: Rizal Province, Hinulugan Taktak (waterfall), *Bartlett 15241, 15245, 15251, 15260, 15270*: Zambales Province, Pannobuan, *Bartlett 14916*. NEGROS, Oriental Negros Province, Dumaguete, *Chapman 99a*.

Distribution: Himalayas, Java, Ceram, Borneo, Formosa, Hawaii.

On damp rocks. More laxly foliate than any of the allied species. The costa ending in a minute spine on the back of the branch leaves is a constant character of some local diagnostic value.

4. **EURHYNCHIUM CELEBICUM** (Bryol. Jav.) Bartram. Plate 32, fig. 324.

Eurhynchium celebicum (Bryol. Jav.) BARTRAM, B. P. Bishop Mus. Bull. 101 (1933) 217.

Hypnum celebicum Bryol. Jav., Bryol. Jav. 2 (1867) 159.

Autoicous; more robust than *E. vagans*, in lax tufts, pale green and glossy above, brown below. Stems creeping, elongate, irregularly pinnate, branches slightly complanate, to 2 cm long. Leaves widely spreading, more or less shrunken and contorted when dry, broadly ovate, acuminate, concave, to 2 mm long, serrulate all around; costa faint, ending near midleaf; cells linear, about 10 µ wide and 8 to 12 times as long, shorter and broader across insertion. Seta smooth, to 2 cm long; capsule horizontal, ovoid, turgid, urn 1 to 1.2 mm long; lid slenderly conic-rostrate, 1 mm long.

LUZON, Benguet Subprovince, Baguio, *Williams 1717*. MINDANAO, Davao Province, *Weber 1477*.

Distribution: Sumatra, Java, Celebes, Tonkin, Hawaii.

On damp banks and rocks.

136. Genus RHYNCHOSTEGIELLA (Br. and Schp.) Limp.

Rhynchostegium subgenus *Rhynchostegiella* BR. & SCHP., Bry. Eur. fasc. 49 and 51 (1852).

Dimunitive plants distinguished from *Eurhynchium* principally by the small size and narrower leaves. The setæ are usually papillose, but this distinction is not constant.

Key to the species of Rhynchostegiella.

1. Leaves obtuse or bluntly acute .... 2. *R. mindorensis.*
   Leaves acuminate .... 2.
2. Setæ 4 to 8 mm long, smooth .... 1. *R. menadensis.*
   Setæ 1.5 to 2 cm long, coarsely papillose........................ 3. *R. Edanoi*

1. **RHYNCHOSTEGIELLA MENADENSIS** (Bryol. Jav.) Bartram comb. nov. Plate 22, fig. 355.

Hypnum Menadense Bryol. Jav., Bryol. Jav. 2 (1867) 156.

Autoicous; slender, dull yellowish-green, feathery, corticolous plants in lax mats. Stems creeping, with numerous short ascending branches less than 1 cm long. Leaves well-spaced, widely spreading, narrowly lanceolate, slenderly acuminate, longitudinally folded and rigid when dry, 2 to 2.5 mm long and 0.5 mm wide, minutely denticulate all around or entire below; costa faint, ending near midleaf; cells linear-rhomboidal, smooth, 6 to 10 μ wide and 5 to 7 times as long. Perichætial leaves slenderly acuminate; seta smooth, slender, 4 to 8 mm long; capsule inclined, urn 1 mm long; lid obliquely rostrate, 0.5 mm long; calyptra cucullate, naked, reaching base of urn; spores 12 to 15 μ.

LUZON, Tayabas Province, near Lucban, *Robinson 9711*: Laguna Province, Mount Maquiling, *Baker 2505*, *Bartlett 15620*, *15625*, *15634*, *15660*, *15662*, *15708a*, *15710a*, *15714a*.

Distribution: Java, Celebes, New Hebrides.

On barks of trees. The slender habit and narrow leaves seem naturally to ally this species with the others grouped under *Rhynchostegiella;* the latter is, at best, a rather poorly defined genus. The habitat on the barks of trees should distinguish it from any of species of the *Eurhynchium* group.

2. **RHYNCHOSTEGIELLA MINDORENSIS** (Broth.) Broth. Plate 22, fig. 356.

Rhynchostegiella mindorensis (Broth.) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 376.

Rhynchostegium mindorense BROTH., Philip. Journ. Sci. § C 2 (1907) 343.

Autoicous; slender, delicate plants in lax, soft tufts, yellowish green. Stems elongate, creeping, densely pinnate, branches erect, to 12 mm long, laxly foliate. Leaves shrunken and contorted when dry, erect-spreading when moist, not or very slightly complanate, ovate, obtuse or bluntly acute, 1 to 1.2 mm long; margins slightly recurved near base, erect and strongly serrulate above; costa stout, ending in a minute spine on back considerably below apex; cells narrowly rhomboidal, opaque, about 4 μ wide and 5 to 6 times as long, minutely papillose at apical angles. Seta 10 to 12 mm long, slender, minutely papillose above, nearly smooth below; capsule inclined, ovoid, urn 1.5 mm long, constricted under mouth when dry; annulus broad; lid short-rostrate from a high convex base.

LUZON, Tayabas Province, Umiray, *Ramos & Edaño 29086*. MINDORO, Alag River, *Merrill 5540* (type).

Endemic.

On damp boulders and twigs of trees. Easily recognized by the bluntly pointed leaves. The plants resemble *R. menadensis* but are uniformly smaller and more delicate.

3. RHYNCHOSTEGIELLA EDAÑOI Broth. Plate 21, fig. 447.

Rhynchostegiella Edañoi BROTH., Philip. Journ. Sci. 31 (1926) 293.

Autoicous; slender, yellowish-green plants in rather dense, soft, thin mats, slightly glossy. Stems elongate, creeping, slightly radiculose, pinnate, branches scarcely 1 cm long, laxly foliate. Leaves horizontally spreading, ovate-lanceolate, slenderly acuminate, up to 1.5 mm long and 0.4 mm wide, serrulate all around; costa faint, ending near midleaf; cells linear, smooth, 6 μ wide and about 10 times as long. Seta slender, to 2 cm long, coarsely and densely papillose; capsule inclined, oblong-cylindric, urn 1.5 mm long; lid 1.5 mm long, slenderly beaked from a high convex base; calyptra cucullate, large; spore papillose 30 to 35 μ.

LUZON, Kalinga Subprovince, Lubuagan, Mount Masingit, *Ramos and Edaño 38218, 38221*: Bontoc Subprovince, Mount Pukis, *Ramos and Edaño 38258*.

Endemic.

On tree trunks. Sharply distinct from *R. mindorensis* in the slenderly acuminate leaves and longer, densely papillose seta.

38. Family ENTODONTACEÆ

Slender or medium-sized plants, often glossy, in flat mats. Stems prostrate, elongate, subpinnately branched, branches terete or flattened. Leaves ovate, concave; costa none or double and short; upper cells elongate, usually smooth, subquadrate at basal angles in numerous rows. Seta elongate, smooth; capsule erect, cylindric, rarely inclined or horizontal; peristome double, teeth papillose or striolate, seldom smooth, segments of endostome narrow from a low basal membrane, frequently rudimentary.

Key to the genera of Entodontaceæ.

1. Leaves plicate .... 139. *Campylodontium.*
   Leaves not plicate .... 2.
2. Wiry plants, branches julaceous, alar cells transversely oval .... 3.
   Soft plants, branches not julaceous, alar cells quadrate .... 4.
3. Capsule erect, cylindric, cells smooth .... 137. *Erythrodontium.*
   Capsule horizontal, ovoid, cells papillose .... 138. *Trachyphyllum.*
4. Quadrate alar cells numerous .... 140. *Entodon.*
   Alar cells not differentiated .... 141. *Plagiotheciopsis.*

137. Genus ERYTHRODONTIUM Hampe

Erythrodontium HAMPE, Symb. 3 (1870) 279.

Rather robust plants in extensive mats. Stems creeping, branches densely foliate, julaceous, rigid. Leaves appressed, broadly ovate, short-pointed; upper cells narrow, transversely oval in numerous rows at basal angles. Seta elongate; capsule erect, cylindric; peristome teeth deeply inserted, striolate, endostome rudimentary.

ERYTHRODONTIUM JULACEUM (Hook.) Par. Plate 23, fig. 246.

Erythrodontium julaceum (Hook.) PAR., Ind. Bryol. ed. 1 (1894) 438.
Neckera julacea HOOK. in Schwaegr. 3 Suppl. 1 fasc. 2 (1829) 245.

Autoicous; rigid, glossy plants in large mats, golden green with a brownish tinge. Stems elongate, copiously branched, branches short, julaceous. Branch leaves crowded, closely imbricated, appressed with spreading tips, broadly ovate, concave, ecostate, about 1 mm long and 0.7 mm wide, abruptly short-pointed; margins erect, minutely denticulate near apex; cells smooth, narrowly elliptical, 6 to 8 µ wide and 4 to 6 times as long, transversely oval in 10 to 12 rows in basal angles forming a large conspicuous group extending obliquely about halfway up margins. Perichætium small; seta erect, 12 to 15 mm long, yellow or pale red; capsule erect, ovoid-cylindric, urn 2 to 2.8 mm long; lid short, conical; annulus none; peristome teeth transversely striolate below and longitudinally striolate above, endo stome rudimentary, segments short and very fragile.

LUZON, Bontoc Subprovince, Mount Masapilid, *Ramos & Edaño 38240*; Bauco, *Vanoverbergh 64, 1350*: Benguet Subprovince, Baguio, *Williams 1677*, *Curran 5128*; Lutab to Kabayan, *McGregor 8790*; Kabayan, *Merrill 4875*; Rizal Province, *Ramos 13645*: Pangasinan Province, Umigan, *Olanes 18959*: Nueva Vizcaya Province, *McGregor 20227*; Dupax, *McGregor 14848*: Tarlac Province, *Merrill 8589*. MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 2655*: Bukidnon Province, *Weber 1508*.

Distribution: India, Assam, Tonkin, Yunnan, Ceylon, Sumatra, Java, Celebes.

Mostly on trees. The neatly julaceous branches and large erect capsules can hardly fail to indicate this species at a glance.

139. Genus TRACHYPHYLLUM Gepp

Trachyphyllum GEPP, Pl. Welwitsch 2 pt. 2 (1901) 298.

Slender, wiry plants in flat mats. Stems creeping, pinnate, branches short, julaceous and curved when dry. Branch leaves broadly ovate, sharply pointed; costa double, short; cells elongate, papillose, transversely oval in numerous rows at basal angles. Seta slender, smooth; capsule horizontal; peristome teeth striolate below, segments of endostome carinate, from a high basal membrane.

TRACHYPHYLLUM INFLEXUM (Harv.) Gepp. Plate 11, fig. 349.

Trachyphyllum inflexum (Harv.) GEPP, Pl. Welwitsch 2 pt. 2 (1901) 298.

Hypnum inflexum HARV., Lond. Journ. Bot. 2 (1840) 20.

Dioicous; slender, dull yellowish-green plants in intricate mats. Stems elongate, irregularly pinnate, branches short, julaceous and strongly curved when dry, up to 7 mm long. Branch leaves small, crowded, erect-spreading when moist, to 0.8 mm long and 0.4 mm wide, broadly ovate, concave, abruptly short-acuminate, minutely crenulate; costa double; cells linear-rhomboidal, 4 to 6 μ wide and 5 to 7 times as long, coarsely papillose, papillæ mostly at apical angles but sometimes on side walls, transversely oval in a large group at basal angles extending obliquely from costa to margin near midleaf. Perichætial leaves about 2 mm long, slenderly acuminate, strongly serrate; seta slender, yellow, 15 mm long, smooth, curved at tip; capsule horizontal, oblong, urn 1 mm long; peristome teeth papillose at tips, striolate below, basal membrane of endostome about half as high as teeth, segments narrow, lid conical, 0.4 mm long.

LUZON, Pangasinan Province, San Quintin, *Antonio 5577*; Umingan, *Onlanes 18960*: Rizal Province, Kay Ungulan, near Teresa, *Bartlett 15309, 15319, 15316, 15317, 15323, 15325*; Mount Susong-Dalaga, *Ramos & Edaño 29449*; Montalban, *Bart-*

lett 14412: Benguet Subprovince, Kias Hill, *Williams 1742:* Bataan Province, Olongapo Naval Reservation, *Bartlett 14115.*

Distribution: India, New Caledonia.

On tree trunks and dry rocks. These collections are all very similar in the essential characters and I can find no reason for referring any of them to *T. papuanum* (Broth.), which is scarcely distinct as far as one can judge from the description.

139. Genus CAMPYLODONTIUM Doz. and Molk.

Campylodontium Doz. & Molk., Ann. Sci. Nat. III Bot. 2 (1844) 301.

Robust, glossy plants in lax, flat mats. Stems creeping, irregularly pinnate, branches tumid, blunt. Leaves ovate-lanceolate, plicate, ecostate; cells linear, smooth, quadrate at basal angles. Seta elongate, smooth; capsule erect, cylindric; peristome teeth deeply inserted, striolate, endostome rudimentary.

CAMPYLODONTIUM FLAVESCENS (Hook.) Bryol. Jav. Plate 23, fig. 350.

Campylodontium flavescens (Hook.) Bryol. Jav., Bryol. Jav. 2 (1865) 128.

Pterogonium flavescens Hook., Musc. Exot. 2 (1819) 165.

Autoicous; relatively large plants, golden-green, glossy, in extensive mats. Stems elongate, irregularly pinnate, branches densely foliate, about 1 cm long. Leaves ovate-lanceolate, acuminate, deeply plicate, ecostate, 2 to 2.5 mm long, minutely denticulate above; cells linear, smooth, 6 to 8 μ wide and 10 to 14 times as long, subquadrate at basal angles in 6 or 8 rows forming a conspicuous differentiated group. Seta about 15 mm long, yellow or reddish; capsule erect, oblong-cylindric, urn 2 to 2.5 mm long; lid conical, 0.7 mm long; peristome teeth short, brown, deeply inserted, transversely striolate below, obliquely and vertically striolate above and often perforate, endostome very rudimentary, segments filiform, fragile; spores papillose, 20 to 28 μ.

LUZON, Rizal Province, Bosoboso, *Ramos 988* in part: Benguet Subprovince, Baguio, *Williams 1884a, 1885;* Buguias, *Bacani 15987.* MINDANAO, Bukidnon Province, *Weber 1506:* Lanao Province, Pugaan Hill, *Bartlett 15907, 15014.*

Distribution: India, Burma, Malay Peninsula, Ceylon, Annam, Sumatra, Java, Celebes, Australia.

On tree trunks. A species of wide distribution that will be readily identified by the deeply plicate leaves with numerous quadrate alar cells in combination with the erect, cylindric capsules.

140. Genus ENTODON C. M.

Entodon C. M., Bot. Zeit. (1844) 740.

Glossy plants in extensive mats. Stems creeping, subpinnately branched, branches usually strongly flattened. Leaves ovate, entire or minutely toothed above; costa short and double or none; cells linear, smooth, subquadrate in a conspicuous alar group. Seta elongate, smooth; capsule erect, cylindric; peristome teeth inserted below rim, often striolate; lid conical.

Key to the species of Entodon.

1. Dioicous, branches terete, setae red .... 2.
Autoicous, branches flattened, setae yellow .... 3.
2. Stems 10 to 12 cm long, stem leaves with a broad base.. 1. *E. ramulosus.*
Stems 3 to 4 cm long, stem leaves contracted to a narrow base.
2. *E. rubicundus.*
3. Segments of endostome much shorter than teeth........ 3. *E. bandongiae.*
Segments of endostome equalling teeth........ 4. *E. plicatus.*

1. ENTODON RAMULOSUS Mitt. Plate 23, fig. 391.

Entodon ramulosus MITT., Trans. Linn. Soc. Bot. II 3 (1891) 179.

Dioicous; pale golden-green glossy plants. Stems elongate, to 12 cm long, forked, regularly pinnate in a long, narrow frond, branches 5 to 10 mm long, terete, widely spreading, often recurved when dry. Stem leaves complanate, ovate from a broad, scarcely contracted base, short-acuminate, 2 mm long, 1 mm wide; branch leaves smaller, ovate-lanceolate, concave, minutely denticulate above; costa double, short; cells linear, subquadrate at basal angles in 6 to 8 rows extending to costa.

LUZON, Pampanga Province, Mount Pinatubo, Camp Stotsenburg, *Elmer 22263.*

Distribution: Japan, China.

As no fruiting specimens of either *E. ramulosus* or *E. rubicundus* have been found in the Philippines, the local records for these species are not above suspicion. Further collections are needed to clarify the distinctions between these two species.

2. ENTODON RUBICUNDUS (Wils.) Jaeg. Plate 23, fig. 392.

Entodon rubicundus (Wils.) JAEG., Adumbr. 2 (1876–1877) 351.
Cylindrothecium rubicundum WILS., in sched.

Dioicous; glossy golden-green plants in dense mats. Stems creeping, closely pinnate, branches about 5 mm long, widely spreading, terete. Stem leaves broadly ovate, short-acuminate, concave, strongly contracted at base, to 1.7 mm long and 1 mm wide, slightly complanate; branch leaves smaller, spreading on all sides, ovate-lanceolate, concave, minutely serrulate above; costa short, double; cells linear, subquadrate in 6 to 8 rows at basal angles forming a large group extending to costa. Sporophyte not seen.

LUZON, Benguet Subprovince, Bauco, *Vanoverbergh 1319.*

Distribution: Himalayas, Khasia, Bhotan, Andaman Islands.

3. ENTODON BANDONGIAE (C. M.) Jaeg. Plate 21, fig. 193.

Entodon bandongiae (C. M.) JAEG., Adumbr. 2 (1875–1876) 356.
Neckera Bandongiae C. M., Syn. 2 (1851) 665.

Autoicous; medium-sized, glossy yellowish-green plants in extensive mats. Stems creeping, irregularly pinnate, complanate-foliate. Leaves 1.5 to 2 mm long, ovate-lanceolate, concave, short and broadly acuminate with point often oblique, denticulate near apex, ecostate; cells linear, 4 to 5 μ wide and 10 to 15 times as long, subquadrate at basal angles in a large group extending to middle of leaf base. Seta erect, stramineous, 1 to 2 cm long; capsule erect, cylindric, urn to 3.2 mm long, sometimes slightly curved; peristome teeth striolate, often slightly perforate, less than 0.5 mm long, endostome rudimentary, segments much shorter than teeth.

LUZON, Pampanga Province, Mount Arayat, *Merrill 5028:* Rizal Province, *Loher 15168;* Mount Irid, *Ramos and Edaño 75064.*

Distribution: Sumatra, Java, Celebes, Formosa.

On boulder faces.

4. ENTODON PLICATUS C. M. Plate 21, fig. 194.

Entodon plicatus C. M., Linnaea (1844) 706.
Entodon longidens BROTH., Oefv. Finsk. Vet.-Soc. Foerh. 47 (1904–1905) 8.

Autoicous; glossy yellowish-green plants closely resembling *E. bandongiae* in habit and foliage characters but distinct in the longer peristome and well-developed segments equal in length to the teeth. Seta to 2.5 cm long; capsule cylindric, urn 2.5 to 3 mm long; peristome teeth to 0.6 mm long, transversely striolate below, vertically striolate above, segments of endostome narrowly linear, vertically striolate, as long as teeth.

LUZON, Benguet Subprovince, Pakdal Hill, *Merrill 9744:* Mount Tonglon, *Merrill 7829:* Baguio, *Williams 1883, Elmer 8452:* Lowod, *Bacani 15904:* Ifugao Subprovince, Payahan, *McGregor 20045:* Bontoc Subprovince, Mount Masapalid, *Ramos and Edaño 38246* in part; Lepanto Subprovince, Bahill, *Merrill 4904:* Nueva Vizcaya Province, Campate, *McGregor 20229.*

MINDANAO, Davao Province, Sibuyan River, *Copeland 978*; Todaya, Mount Apo, *Williams 2651*; Lanao Province, Camp Keithley, *M. S. Clemens "O;"* Pugaan Hill, *Bartlett 15587, 15889, 55898, 15989.*

Distribution: Himalayas, Ceylon, Celebes.

On damp rocks and trees. The peristome teeth project 0.4 to 0.6 mm above the rim, and as Dixon has remarked[*] the Philippine plants seem to be inseparable from *E. plicatus*. The segments in *E. bandongiae* and *E. plicatus* are vertically striolate.

141. Genus PLAGIOTHECIOPSIS Broth.

Plagiotheciopsis BROTH., Philip. Journ. Sci. § C 8 (1913) 87.

Rather robust plants, yellowish green, glossy, in lax, soft mats. Stems creeping, pinnate, branches spreading, strongly complanate-foliate. Leaves ecostate, ovate, concave, acute, laxly areolate; cells elongate, smooth, not differentiated at basal angles. Seta slender, elongate, smooth; capsule suberect, cylindric; lid conic-rostrate; peristome teeth striolate, segments narrow, as long as teeth.

PLAGIOTHECIOPSIS PHILIPPINENSIS Broth. Plate 23, fig. 315.

Plagiotheciopsis philippinensis BROTH., Philip. Journ. Sci. § C 8 (1913) 87.

Autoicous; stems elongate, sparingly radiculose, pinnately branched, branches strongly flattened, about 3 mm wide with leaves. Lateral leaves ovate, concave, broadly acute or minutely apiculate, 1.5 mm long, 0.6 mm wide, ecostate; cells lax, oval-hexagonal, thin-walled, smooth, 8 to 10 μ wide and 4 to 6 times as long, shorter across insertion, without any differentiated alar group; dorsal and ventral leaves slightly smaller and short-acuminate. Seta slender, to 2 cm long; capsule slightly inclined, cylindric, urn 2 mm long; peristome teeth reflexed at base with circinate-incurved points when dry, broadly bordered by much wider dorsal plates and sinuate on edges, striolate below, papillose above, segments of endostome papillose, keeled, as long as teeth, from a low basal membrane; lid obliquely conic-rostrate, 0.8 mm long; spores minutely papillose, 10 to 14 μ.

MINDANAO, Davao Province, *Weber 1479* (type): Agusan Province, *Fenix 15930*.

Endemic.

On tree trunks in open forest. A curious plant with the habit and foliage of *Plagiothecium* but sharply distinct in the peristome structure. The broadly bordered peristome teeth with sinuate edges and narrow ventral plates are strikingly different from those of any of the allied genera.

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[*] Ann. Bryol. 7 (1934) 36.

39. Family PLAGIOTHECIACEÆ

Medium-sized plants, glossy, forming mats. Stems creeping, irregularly pinnate, strongly complanate-foliate. Leaves ovate, short-pointed, often asymmetrical; costa short and double or single to about midleaf; cells linear, smooth, subquadrate, alar cells numerous or few and poorly defined. Seta elongate, capsule nodding or erect; peristome double, perfect, teeth striolate, endostome with a high basal membrane, segments keeled, cilia usually present.

Key to the genera of Plagiotheciaceæ.

Costa single, quadrate alar cells numerous	142. *Stereophyllum.*
Costa double, short, alar cells few or none	143. *Plagiothecium.*

142. Genus STEREOPHYLLUM Mitt.

Stereophyllum MITT., Journ. Linn. Soc. Bot. Suppl. 1 (Musc. Ind. Or.) (1859) 117.

Stems prostrate, irregularly branched, complanate-foliate. Leaves crowded, short-pointed, lateral rows asymmetrical; costa single, ending near midleaf; upper cells linear, shorter toward base, subquadrate in numerous rows at basal angles. Perichætium small; seta elongate; capsule horizontal to suberect, ovoid; lid conic-rostrate, usually short and oblique.

STEREOPHYLLUM ANCEPS (Bryol. Jav.) Broth. Plate 23, fig. 356.

Stereophyllum anceps (Bryol. Jav.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1907) 898.

Stereophyllum philippinense BROTH., Philip. Journ. Sci. 31 (1926) 294.

Hypnum anceps Bryol. Jav. 2 (1860) 161, *pl. 260.*

Rather small, yellowish or deep-green, lustrous plants in thin mats. Stems irregularly branched, branches short, blunt, very flat. Leaves strongly complanate, lateral rows slightly larger and asymmetrical, oblong-lanceolate, concave, broadly acute, inflexed on one side below, 2 to 2.3 mm long, minutely denticulate near apex; costa broad at base, tapering quickly upward and ending near or just above midleaf; cells linear, smooth, 5 to 7 µ wide and 10 to 15 times as long, subquadrate in many rows at basal angles, often filling entire leaf base on broad side and extending obliquely up margins. Seta slender, smooth, 7 to 10 mm long; capsule erect or slightly inclined, narrowly ovoid-cylindric, urn 1.5 mm long; peristome teeth striolate.

LUZON, Rizal Province, *Foxworthy 17*; Bosoboso, *Ramos 1175*; Antipolo, *Ramos and Edaño 29577*; Montalban, *Bartlett 14500, 14520*; Kay Ungulan, *Bartlett 15308, 15310, 15315, 15334*: Nueva Ecija Province, Cabanatuan, *McGregor 5265*: Benguet Subprovince, Twin Peaks, *Williams 1744*: Bulacan Province, Kay Tianak, *Bartlett 14704, 14721*: Laguna Province, Lake Bunot, *Bartlett 15220*: Zambales Province, Olongapo, Mount Ilingin, *Ebalo 60*.

Distribution: India, Java.

On bark of trees. *S. philippinense* is slightly smaller and more delicate in texture than typical *S. anceps*, but the difference is so slight that specific distinctions between them can hardly be maintained.

143. Genus PLAGIOTHECIUM Br. and Sch.

Plagiothecium Br. & Schr., Bry. Eur. fasc. 48 (1851).

Robust plants in thin mats. Stems creeping, irregularly branched, branches strongly complanate-foliate. Leaves slightly asymmetrical, ovate, concave, short-pointed, decurrent; costa short and double; cells narrowly linear, smooth, more lax at base. Seta elongate; capsule inclined; peristome perfect, endostome with segments and cilia well developed from a high basal membrane.

PLAGIOTHECIUM NECKEROIDEUM Br. and Sch. Plate 18, fig. 397.

Plagiothecium neckeroideum Br. & Schr., Bry. Eur. fasc. 48 (1851) *pl. 596*.

Dioicous; robust, glossy, yellowish-green plants in lax mats. Stems sparingly and irregularly branched, strongly complanate-foliate, branches 4 to 5 mm wide with leaves. Leaves ovate-lanceolate, 2 to 2.5 mm long and 1.2 mm wide, acute, contracted to insertion, decurrent at basal angles, undulate toward apex, lateral rows widely spreading and very asymmetrical, minutely denticulate near apex; costa double, short, unequally forked; cells linear, 5 to 7 μ wide and 12 to 16 times as long, larger and laxer at base. Seta to 23 mm long, capsule not seen.

LUZON, Benguet Subprovince, Mount Pulog, *Curran, Merritt, & Zschokke 16352*.

Distribution: Europe, Sikkim, Japan, Java.

This species has a peculiar disrupted geographical distribution. It will be readily recognized by the strongly flattened stems with the leaves lightly undulate above and decurrent at the basal angles.

40. Family SEMATOPHYLLACEÆ

Slender or robust plants in dense mats or tufts, often glossy. Stems creeping or ascending, irregularly or pinnately branched. Leaves ovate, mostly acuminate; costa short and double or none; cells linear, smooth or papillose, large and often inflated at basal angles in a conspicuous colored group. Seta elongate, smooth or papillose; capsule small, mostly inclined or horizontal, peristome usually double and perfectly developed; lid rostrate, rarely conical; calyptra cucullate.

Key to the genera of Sematophyllaceæ.

1. Branches with clusters of brood filaments near tips .... 2.
   Plants without brood filaments .... 3.
2. Branches caudate at tips .... 144. *Aptychella.*
   Branches not caudate .... 145. *Clastobryella.*
3. Leaves coarsely spinose-serrate, setæ very long .... 4.
   Leaves not spinose-serrate, setæ shorter .... 5.
4. Lid conical, short, leaves unbordered .... 146. *Mastopoma.*
   Lid conic-rostrate, leaves bordered .... 148. *Trismegistia.*
5. Stems bipinnate, branches curved and attenuate .... 147. *Acanthocladium.*
   Stems pinnate, branches straight and blunt .... 6.
6. Peristome single, endostome none .... 149. *Meiothecium.*
   Peristome double .... 7.
7. Peristome teeth much shorter than segments .... 160. *Macrohymenium.*
   Peristome teeth equalling or longer than segments .... 8.
8. Calyptra mitriform .... 152. *Warburgiella.*
   Calyptra cucullate .... 9.
9. Peristome teeth not transversely striolate .... 150. *Chionostomum.*
   Peristome teeth transversely striolate .... 10.
10. Leaf cells smooth .... 11.
    Leaf cells papillose .... 14.
11. Peristome teeth with a median furrow .... 156. *Acroporium.*
    Peristome teeth with a fine, zigzag median line .... 12.
12. Leaves falcate-secund, exothecial cells not collenchymatous.
    151. *Brotherella.*
    Leaves erect-spreading, exothecial cells collenchymatous .... 13.
13. Leaves abruptly subulate-acuminate, robust plants.
    154. *Rhaphidostichum.*
    Leaves gradually acuminate, smaller plants .... 153. *Sematophyllum.*
14. Lid conical, short, peristome teeth with a zigzag median line .... 15.
    Lid with a long, needlelike beak, peristome teeth furrowed .... 17.
15. Costa double, cells papillose at apical angles .... 159. *Glossadelphus.*
    Costa none, cells papillose over lumina .... 16.
16. Leaf cells unipapillate .... 157. *Acanthorrhynchium.*
    Leaf cells pluripapillate .... 158. *Taxithelium.*

17. Capsules erect, plants very slender.............................. 155. *Acroporium.*
Capsules pendulous, coarser plants.............................. 156. *Trichosteleum.*

144. Genus APTYCHELLA Herz.

Aptychella HERZ., Bibl. Bot. 87 (1916) 157.

Tufted, glossy plants. Stems creeping, irregularly branched, branches often with clusters of brood filaments towards tips. Leaves ovate, concave; cells linear, shorter and colored across insertion, not inflated at basal angles. Capsule erect; peristome teeth papillose.

APTYCHELLA ROBUSTA (Broth.) Fleisch. Plate 35, fig. 158.

Aptychella robusta (Broth.) FLEISCH., Laubmfl. Java 4 (1923) 1671.
Clastobryum robustum BROTH., Philip. Journ. Sci. § C 5 (1910) 155.

Dioicous; relatively robust, golden-green glossy plants in dense tufts. Stems creeping, densely pinnate, branches ascending, laxly foliate, to 2 cm long, about 4 mm wide with leaves, caudate and often with conspicuous clusters of smooth, brown, septate brood filaments near flagelliform tips. Leaves erect-spreading, oblong-lanceolate, slenderly acuminate, decurrent, concave, to 2.5 mm long; margins narrowly recurved below, erect and minutely serrulate above; costa double and short; cells narrowly linear, 5 µ wide and about 15 times as long, smooth, several rows across insertion short and brownish, alar cells numerous in an irregular group, rounded hexagonal, pellucid, not at all inflated. Sporophyte unknown.

LUZON, Benguet Subprovince, Mount Pulog, *McGregor 8912* (type); Mount Santo Tomas, *Williams 2158, Bartlett 15283b.*

Distribution: Hawaii.

The larger size and flagelliform branch tips will preclude any confusion with the *Clastobryella* species.

145. Genus CLASTOBRYELLA Fleisch.

Clastobryella FLEISCH., Nova Guinea (2) 12 (1913) 121.

Slender, glossy, tufted plants. Stems creeping, densely branched, branches short and suberect, often with clusters of papillose brood filaments toward tips. Leaves ecostate, ovate-lanceolate, acuminate, sharply serrate above; cells linear, smooth or papillose, differentiated and colored at basal angles. Seta smooth or papillose above; capsule erect.

Key to the species of Clastobryella.

Alar cells large, inflated.............................. 1. *C. cucullifera.*
Alar cells small, rounded, not inflated.............................. 2. *C. Merrillii.*

1. **CLASTOBRYELLA CUCULLIGERA** (Lac.) Fleisch. Plate 23, fig. 399.

Clastobryella cuculligera (Lac.) FLEISCH., Nova-Guinea (2) 12 (1913) 121.
Hypnum cuculligerum LAC., Bryol. Jav. 2 (1869) 218.
Clastobryum papillosum WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 360.

Dioicous; small, slender, golden-green plants, densely tufted. Stems creeping, irregularly pinnate, branches to 8 mm long, laxly foliate, frequently bearing clusters of brown, papillose brood filaments toward ends. Leaves ovate-lanceolate, erect-spreading, to 1.2 mm long, concave; margins more or less reflexed, sharply serrate above; cells linear, 4 µ wide and 10 to 15 times as long, papillose at apical angles on back, colored across insertion, alar cells conspicuous, 4 or 5, large and inflated, deep brown. Sporophyte not seen.

LUZON, Benguet Subprovince, Baguio, *Williams 8157:* Tayabas Province, Baler, *Santos 356a.*

Distribution: Java.

On trees. The leaf cells in *Clastobryum papillosum* Williams seem to be more sharply papillose on the average than in the Java plants, but otherwise they are identical in all essential details. I doubt very much whether they can be separated with any satisfaction.

2. **CLASTOBRYELLA MERRILLII** (Broth.) Fleischer. Plate 23, fig. 400.

Clastobryella Merrillii (Broth.) FLEISCH., Laubmfl. Java 4 (1917) 1200.
Clastobryum Merrillii BROTH., Philip. Journ. Sci. § C 8 (1913) 80.

Dioicous; small, slender, brownish plants in dense tufts. Stems creeping, densely pinnate, branches ascending, to 6 mm long, laxly foliate, or shorter, microphyllous, and terete, often bearing clusters of brown, papillose, septate brood filaments toward tips. Leaves erect-spreading, ecostate, ovate, concave, contracted above insertion, short-acuminate; margins erect, serrulate to base; cells linear, minutely papillose at apical angles, 4 µ wide and 8 to 10 times as long, alar cells rounded, incrassate, in a small but well-defined group. Seta slender, reddish, smooth, 6 to 8 mm long. Capsule unknown.

LUZON, Benguet Subprovince, Pauai, *Merrill 6677, Copeland 1846.*

Endemic.

On tree trunks. Well characterized by the ovate, short-pointed leaves and small rounded alar cells.

146. Genus MASTOPOMA Card.

Mastopoma CARD., Rev. Bryol. (1901) 116.

Pseudoautoicous; usually robust, glossy plants in lax or dense mats. Stems creeping, pinnately branched. Leaves crowded, erect-spreading or secund, ovate-lanceolate, concave, spinose-serrate in upper half; costa short and double or none; cells linear, smooth, alar group inflated and colored. Seta very long, curved at tip; capsule horizontal, ovoid; lid short, conical, apiculate, not beaked.

Key to the species of Mastopoma.

Leaves falcate-secund, peristome teeth furrowed.......... 1. *M. uncinifolium.*
Leaves erect-spreading, peristome teeth not furrowed....... 2. *M. Robinsonii.*

1. **MASTOPOMA UNCINIFOLIUM** (Broth.) Card. Plate 23, fig. 407.

Mastopoma uncinifolium (Broth.) CARD., Rev. Bryol. (1901) 116.
Acanthocladium uncinifolium BROTH., Monsunia 1 (1900) 176.

Rather robust, glossy, tufted plants, yellowish green or brownish. Stems elongate, creeping, densely pinnate, branches spreading, under 1 cm long. Leaves crowded, 1.5 mm long, falcate-secund, lanceolate from an ovate, concave base, acuminate, ecostate, entire below, spinose-serrate in upper half; cells linear, smooth, 4 μ wide and 40 to 50 μ long, shorter and yellow across insertion, alar cells 3 to 4, large and inflated. Perichætial leaves erect, 3 to 4 mm long, slenderly acuminate, coarsely serrate; seta to 4.5 cm long, flexuose, red, smooth; capsule horizontal, turgid ovoid, asymmetrical, urn 1 mm long; lid conic, apiculate, deep red; peristome teeth yellow, densely striolate, with a wide median furrow, segments of endostome keeled, papillose, from a high basal membrane; calyptra 5 mm long, narrow, cucullate.

NEGROS, Oriental Negros Province, Cuerno de Negros, *Maydamo 62, 68, 87 in part, 88, 89, 91.* MINDANAO, Davao Province, Mount Batangan, *Warburg.*

Distribution: Borneo.

On trees. The Warburg collection is referred to *Acanthocladium Armitii* Broth. and Geheb. by Brotherus.[10] The specimen is small and incomplete, with several old setæ lacking capsules. The setæ are essentially smooth and the leaves falcate-secund and long-acuminate. In these particulars the plants differ in no way that I can see from *M. uncinifolium* as represented by the ample specimens in good fruit from Negros and the collections from British North Borneo by J. and M. S. Clemens. The peristome teeth are broadly furrowed along the median line in all the capsules I have examined.

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[10] Monsunia 1 (1900) 177.

1. MASTOPOMA ROBINSONII (Broth.) Bartram comb. nov. Plate 23, fig. 402.

Acanthocladium Robinsonii BROTH., Philip. Journ. Sci. § C 5 (1910) 159.

Robust, golden-green plants in dense mats, glossy. Stems creeping, irregularly pinnate and bipinnate, branches spreading, slightly complanate, slender, cuspidate at tips. Leaves erect-spreading, rigid, ecostate, gradually narrowed to a broadly linear acumen from an ovate-lanceolate, concave base, serrate in upper half, to 2.5 mm long and 0.6 mm wide; cells narrowly linear, smooth, alar cells large, inflated and colored. Leaves of ultimate branches smaller. Perichætial leaves 4.5 mm long, gradually narrowed to a long, linear, spinose-serrate acumen; seta to 5.5 cm long, red, smooth, curved at tip; capsule inclined, asymmetrical, urn 2 mm long; peristome teeth densely striolate, with a fine zigzag median line, not furrowed, segments of endostome from a basal membrane about ½ height of teeth; lid short, conic, apiculate, 0.6 mm long; calyptra large, cucullate, 5 mm long; spores about 15 μ, minutely papillose.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 19925*: Laguna Province, Mount Banahao, *Robinson 6566* (type).

Endemic.

Thoroughly distinct from *M. uncinifolium* in the rigidly erect-spreading, complanate leaves, less strongly toothed above. I have not seen *M. subrobustum* Dix. of Borneo, but the description suggests a plant very close to *M. Robinsonii*.

147. Genus ACANTHOCLADIUM MITT.

Acanthocladium MITT., Austral. Moss. in Trans. & Proc. Roy. Soc. Victoria 19 (1883) 85.

Medium-sized, glossy plants in dense mats. Stems elongate, creeping, pinnate or bipinnate, branches spreading, often curved and attenuate. Leaves erect-spreading, concave, ovate, long-acuminate, weakly toothed; costa none or short and double; cells linear, smooth or papillose, colored across insertion, alar cells large, vesiculose. Seta elongate, smooth; capsule horizontal, gibbous; peristome double, perfect; lid conic-rostrate.

ACANTHOCLADIUM BENGUETENSE Broth. Plate 24, fig. 403.

Acanthocladium benguetense BROTH., Philip. Journ. Sci. 31 (1926) 294.

Slender, densely matted, glossy plants, yellowish or brownish green. Stems twice pinnate, branches spreading, curved, ultimate branchlets attenuate. Stem leaves erect-spreading, ovate, gradually subulate-acuminate, concave, ecostate, to 1.6 mm long, denticulate near apex; cells linear, minutely papillose at apical angles, 4 μ wide and 10 times as long, laxer across insertion, alar cells large, inflated, yellowish or hyaline. Branch leaves smaller, ovate-lanceolate, deeply concave. Perichætial leaves abruptly loriform-acuminate, serrulate above; seta to 2.5 cm long, red, smooth; capsule horizontal, ovoid, gibbous at back, urn 2 mm long; lid obliquely conic-rostrate, 1.5 mm long; peristome teeth densely striolate, with a fine median line, segments of endostome from a high basal membrane; calyptra cucullate, 3.5 mm long.

LUZON, Benguet Subprovince, Pauai, *Santos 32065* (type). *Copeland 1835*; "Haight's in the Oaks," *Mearns 4558*; Mount Santo Tomas, *Williams 1718, Hadden 141, Bartlett 13295*; Mount Data, *Bacani 16015*.

Endemic.

On logs in mountain forests. Some of these specimens have been referred to *A. deflexifolium* (Mitt.) Ren. & Card. (*Acanthodium deflexifolium* Mitt.) of Sikkim and Bhotan, which seems to be an unpublished species. Whether or not the local plants are conspecific with those of the Himalayas I do not know.

148. Genus TRISMEGISTIA (C. M.) Broth.

Hypnum § *Trismegistia* C. M., Journ. Mus. Godeffr. 6 (1874) 89.
Trismegistia (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1077.

Mostly dioicous; large, attractive glossy plants in intricate, deep tufts. Primary stems very long, arched or ascending; secondary stems erect, much branched above, branches densely foliate. Leaves erect-spreading, concave, lanceolate or lingulate from an ovate base, broadly acuminate, usually broadly bordered above and coarsely toothed in upper half; costa short and double or none; cells oval or oval-rhomboidal, smooth, inflated and colored at basal angles. Seta very long, red; capsule large, horizontal; peristome perfect; lid conic-rostrate.

Key to the species of Trismegistia.

1. Upper leaf cells short, with oval lumens.................. 1. *T. panduriformis*.
   Upper leaf cells elongate, with narrow lumens.................................... 2.
2. Stems lax, prostrate, without erect, rigid branches........ 2. *T. calderensis*.
   Stems rigid, with erect, more or less dendroid branches.............................. 3.

3. Branch leaves weakly bordered, lid conic, short.................... 3. *T. rigida.*
   Branch leaves strongly bordered, lid long, conic-rostrate.. 4. *T. lancifolia.*

1. TRISMEGISTIA PANDURIFORMIS (C. H. Wright) Broth. Plate 24, fig. 405.

Trismegistia panduriformis (C. H. Wright) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 415.

Sematophyllum panduriformis C. H. WRIGHT, Trans. Linn. Soc. Bot. 4 (1894–1896) 258.

Acanthocladium Prionodontella BROTH., Monsunia 1 (1900) 177.

Dioicous; robust, rigid plants in lax, deep tufts, yellowish or brownish-green, glossy. Primary stems long, woody, flexuose and arched; secondary stems erect, pinnately branched, densely foliate. Leaves erect-spreading, ecostate, concave, ligulate lanceolate from an ovate base, acute or short-acuminate, to 4 mm long, broadly bordered above; margins erect, coarsely and distantly serrate above and serrate nearly to base; upper cells oval, 5 to 7 µ wide, 7 to 20 µ long, gradually elongate and porose below, 3 to 6 rows at margins linear, incrassate, forming a distinct yellowish pellucid border merging with narrow cells of leaf base, alar cells large, inflated and golden brown. Perichætium large, inner leaves to 6 mm long, plicate, loriform-acuminate, serrate; seta 5 to 6 cm long, red, glossy; capsule horizontal, gibbous, turgid, ovoid, urn 3 mm long; lid conic-rostrate, red, 1 mm long.

MINDORO, Mount Halcon, *Merrill 5400*. MINDANAO, Bukidnon Province, Tangculan, *Ramos and Edaño 37177*.

Distribution: Borneo.

Upon comparing the Philippine plants with *T. panduriformis* from Mount Kinabalu I fail to find any distinctions of importance. The habit, coloring, and structure are alike to the smallest detail. The Borneo collections show the basal leaf cells slightly more porose on the average, but this is neither a strong nor a constant distinction.

2. TRISMEGISTIA CALDERENSIS (Sull.) Broth. Plate 24, fig. 406.

Trismegistia calderensis (Sull.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1070.

Hypnum calderense SULL., Proc. Am. Acad. Arts Sci. 3 (1855) 184

Relatively slender plants, yellowish green, glossy. Primary stems elongate, prostrate; secondary stems laxly ascending, irregularly pinnate, densely foliate, cuspidate at tips, rather weak and flexuous. Leaves erect-spreading, points slightly convolute and twisted when dry, ovate-lanceolate, slenderly acuminate, acumen usually twisted in a half turn, coarsely and distantly serrate in upper half, to 3 mm long and 1 mm wide; costa very short and double; cells narrowly linear-rhomboidal above, 5 µ wide and 6 to 7 times as long, slightly porose, longer and incrassate toward margins in several rows forming an indistinct border in upper part of leaf, elongate and incrassate below, alar cells inflated, transversely divided, forming a large golden-brown group extending nearly to middle of leaf. Branch leaves smaller and more strongly toothed. Sporophyte not seen.

LUZON, Laguna Province, Mount Maquiling, *Elmer 18426, 18426a, Robinson 6028*; Mount Banahao, *Ocampo 28017*.

Distribution: Sumatra.

Although closely allied to *T. rigida* in leaf structure this species appears to be distinct in the lax, slender habit. It is by no means a clear-cut species as far as the limited material available is concerned.

6. **TRISMEGISTIA RIGIDA** (Hornsch. and Reinw.) Broth. Plate 44, fig. 406.

Trismegistia rigida (Hornsch. & Reinw.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1078.

Hypnum rigidum HORNSCH. & REINW., Nov. Act. Acad. Caes. Leop. 14 Suppl. 2 (1823) 731.

Trismegistia densirctis BROTH., Philip. Journ. Sci. 31 (1926) 295.

Large plants in deep lax tufts, yellowish or brownish green. Primary stems creeping, flexuose or arched; secondary stems erect, rigid, simple below, bipinnately branched above, often dendroid in habit, branches densely foliate, cuspidate at tips. Leaves of secondary stems erect-spreading, ovate-lanceolate, ecostate, acuminate, to 2.5 mm long, indistinctly bordered; branch leaves smaller, more coarsely toothed, gradually acuminate, acumen often twisted a half turn; cells 5 µ wide and 6 to 8 times as long, alar group large, golden brown, cells inflated and transversely divided. Seta to 7 cm long or longer, red; capsule horizontal, gibbous; lid conic-rostrate, short.

LUZON, Cagayan Province, Mount Cagua, *Edaño 79727*; Mount Babalugin, *Edaño 79806*; Kilingkiling, *Edaño 79756*: Apayao Subprovince, Mount Sulu, *Fenix 28453*; Tayabas Province, Baler, *Santos 219, 348*. NEGROS, Oriental Negros Province, Cuernos Mountains, *Elmer 9877*. MINDANAO, Davao Province, Mount Batangan, *Warburg*. CAMIGUIN DE MINDANAO, *Ramos 14900*.

Distribution: Siam, Annam, Sumatra, Java, Borneo, New Caledonia, New Guinea.

T. densirctis Broth. is surely one of the forms of this variable species. The indistinctly bordered leaves are characteristic of the species and help to distinguish it from *T. lancifolia*.

4. **TRISMEGISTIA LANCIFOLIA** (Harv.) Broth. Plate 24, fig. 407.

Trismegistia lancifolia (Harv.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1078.

Neckera lancifolia HARV., Lond. Journ. Bot. (1840) 14.

Acanthocladium Merrillii BROTH., Philip. Journ. Sci. 3 C 3 (1908) 29.

Large wiry plants in extensive, deep tufts, closely resembling *T. rigida* in habit and coloring. Primary stems very long, often stoloniferous; secondary stems erect, often dendroid and copiously branched above, branches slightly complanate, blunt at tips. Leaves of ultimate branches narrowly ovate-lanceolate, concave, slightly narrowed to a lingulate point, short-acuminate, sharply serrate above and distinctly bordered with 2 or 3 rows of narrow, thick-walled cells in upper half; cells linear-rhomboidal, shorter and broader near apex, alar group as in *T. rigida*. Stem leaves larger and less strongly toothed. Seta to 6 cm long; capsule horizontal; lid long and slenderly beaked, as long as urn.

Numerous representative collections from all of the larger islands.

Distribution: Nepal, Malay Peninsula, Sumatra, Java, Borneo.

On trees and logs in damp forests. Closely allied to *T. rigida* but usually distinguished without much trouble by the more broadly pointed and more strongly bordered branch leaves. When capsules are available the long slenderly beaked lid is characteristic. The specimen of *T. Merrillii* shows this typical lid and is in no way different from *T. lancifolia* as far as I can see.

TRISMEGISTIA LANCIFOLIA (Harv.) Broth. var. **KORTHALSII** (Doz. and Molk.) Fleisch.

Trismegistia lancifolia (Harv.) Broth. var. *Korthalsii* (Doz. & Molk.) FLEISCH., Laubmfl. Java 4 (1923) 1229.

Hypnum Korthalsii DOZ. & MOLK., Musc. Frond. Archip. Ind. (1844) 11.

Very robust, woody, and rigid. Secondary stems and branches not flattened, cuspidate at tips. Leaves spreading on all sides, those of ultimate branches more slenderly acuminate from a broader base.

LUZON, Laguna Province, Mount Maquiling, *Robinson 6628*, *Calvin 331*. NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 65, 69*. MINDANAO, Davao Province, Mount Apo, *Williams 2607*.

Distribution: Sumatra, Java, New Guinea.

Quite distinct in the robust habit, terete, cuspidate stems, and the long-acuminate branch leaves.

149. Genus MEIOTHECIUM Mitt.

Meiothecium MITT., Journ. Linn. Soc. Bot. (1868) 185.

Slender or medium-sized plants in dense tufts or mats, yellowish green, glossy. Stems creeping, branches ascending, blunt, densely foliate. Leaves ovate, concave, ecostate, entire, usually short-pointed; cells oval-rhomboidal, longer below, often obliquely oval in numerous rows toward basal margins, alar cells usually large and inflated. Perichætium small; seta short, often curved, smooth or slightly pustulose above; capsule erect or inclined; peristome single, teeth usually papillose, endostome none; lid small, conic-rostrate; calyptra small.

Key to the species of Meiothecium.

1. Leaf tips spirally recurved .... 1. *M. hamatum.*
Leaf tips erect .... 2.
2. Leaves sharply acuminate, cells incrassate .... 2. *M. attenuatum.*
Leaves broadly pointed, cells not incrassate .... 3.
3. Slender, minute plants, leaves less than 1 mm long .... 3. *M. bogoriense.*
Larger plants, leaves 1 to 1.5 mm long .... 4. *M. microcarpum.*

1. **MEIOTHECIUM HAMATUM** (C. M.) Broth. Plate 14, fig. 408.

Neckera hamata C. M., Syn. 2 (1851) 78, 666.
Meiothecium hamatum (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1103.
Meiothecium obtusum BROTH., Philip. Journ. Sci. § C 13 (1918) 219.

Autoicous and synoicous; rather robust plants in dense tufts, golden-green tinged with brown, glossy. Stems creeping, densely pinnate, branches ascending, terete. Leaves crowded, erect and appressed when dry, oblong-ovate, concave, lightly plicate, short-acuminate, acumen recurved with tip usually closely coiled, 2 mm long and 0.6 mm wide; margins recurved all around, entire; cells linear, incrassate, porose, 3 to 4 µ wide, 30 to 35 µ long, golden yellow across insertion, alar cells large, inflated, colored or hyaline. Seta 5 to 6 mm long, faintly pustulose above, curved at tip; capsule inclined or horizontal, narrowly ovoid, urn 1.5 mm long; lid obliquely rostrate; peristome teeth pale, papillose; spores large.

PANAY, Capiz Province, Mount Bulilao, *Martelino & Edaño 35812, 35815.*

Distribution: Ceylon, Sumatra, Java, Fiji.

On dead wood. The curiously recurved leaf apex is the distinguishing mark of this species. The leaf tip is so closely coiled in most cases that close scrutiny is necessary to ascertain the actual shape of the point. I find no obtusely pointed leaves among those I have examined and cannot avoid the conclusion that *M. obtusum* Broth. is identical with the Java plant figured in the Bryologia Javanica.

4. MEIOTHECIUM ATTENUATUM Broth. Plate 24, fig. 429.

Meiothecium attenuatum BROTH., Philip. Journ. Sci. § C 8 (1913) 92.

Medium-sized plants in dense tufts, yellowish green tinged with brown, slightly glossy. Stems creeping, irregularly pinnate, branches ascending, densely foliate. Leaves erect when dry, erect-spreading when moist, to 2.5 mm long and 0.6 mm wide, oblong-lanceolate, sharply acuminate, entire, ecostate; cells linear-rhomboidal, incrassate, porose, 5 to 6 μ wide, 6 to 8 times as long, narrowly linear below, alar cells inflated and colored; margins reflexed. Sporophyte as in *M. hamatum*.

LUZON, Benguet Subprovince, Baguio, *Merrill 7932*, *Williams 1748*: Laguna Province, San Antonio, *Ramos 19094*: Tayabas Province, Mauban, Barrio Luya-luya, *Pastrana 58*, *63*. MINDANAO, Agusan Province, *Weber 1282*.

Endemic.

On trees. Similar to *M. hamatum* in size and structure but widely distinct in the erect leaf apices. The leaf cells are also uniformly broader above.

5. MEIOTHECIUM BOGORIENSE Fleisch. Plate 24, fig. 430.

Meiothecium bogoriense FLEISCH., Laubfl. Java 4 (1919) 1228.

Dioicous; very small, slender plants in rather dense mats, yellowish green glossy. Stems creeping, irregularly pinnate, branches short, rigid, more or less curved, laxly foliate. Branch leaves to 0.6 mm long, oblong-ovate, bluntly acute, concave, widely spreading when moist, ecostate; margins erect, entire; cells oval-rhomboidal, thin-walled, 6 to 7 μ wide, 2 to 3 times as long, minutely papillose at apical angles, median basal cells linear, rhomboidal in 4 or 5 rows toward margins, not colored across insertion, alar cells oval, hyaline, not sharply defined. Stem leaves slightly larger and short-acuminate. Seta about 3 mm long, more or less curved and slightly pustulose; capsule inclined, urn 1 mm long.

LUZON, Laguna Province, Paete, *Bartlett 15277*: Tayabas Province, Mauban, Barrio Luya-luya, *Pastrana 54*, *56*, *60*. CAMIGUIN DE MINDANAO, *Ramos 14897*.

Distribution: Singapore, Java.

These collections are sterile, but the gametophyte characters are exactly like those in the Java plants and I have no hesitation in referring them here. The slender habit and minute leaves are in marked contrast to any form of *M. microcarpum*.

4. **MEIOTHECIUM MICROCARPUM** (Harv.) Mitt. Plate 31, fig. 412.

Meiothecium microcarpum (HARV.) MITT., Linn. Soc. Journ. Bot. (1869) 185.

Pterogonium microcarpum HARV., Lond. Journ. Bot. (1840) 12.

Autoicous; medium-sized plants in flat mats, yellowish green, slightly glossy. Stems creeping, irregularly pinnate. Leaves erect and appressed when dry, erect-spreading and often slightly secund when moist, ecostate, oblong-ovate, short-acuminate, concave, plicate, to 1.5 mm long; margins entire, irregularly inflexed; cells oval-rhomboidal, 5 to 6 μ wide and 5 to 6 times as long, with firm, pale walls, minutely papillose at apical angles, inner basal cells linear, abruptly rhomboidal, in 10 to 12 rows toward margins and extending obliquely upward, short and golden brown across insertion, alar cells large, hyaline or colored. Seta 3 to 4 mm long, nearly smooth; capsule inclined, ovoid-cylindric, urn 1.5 mm long; lid slenderly conic-rostrate; peristome teeth well spaced, coarsely papillose; calyptra small, more or less papillose above, cleft at base.

LUZON, Nueva Vizcaya Province, vicinity of Dupax, *McGregor 14847*: Benguet Subprovince, Baguio, *Williams 1785*: Tayabas Province, Mauban, *Pastrana 15*. CEBU, Mainit, Carcar, *Nemenzo 18*. MINDANAO, Cotabato Province, *Robinson 11706*.

Distribution: Nepal, Ceylon; wide in Malaysia, New Guinea, New Caledonia.

Mostly on trees. In all of these collections the leaves are slightly narrower than in the typical form, the margins are often more or less recurved and the setæ not quite smooth. These are the characters used to distinguish *M. Jagori* (C. M.), but they are so inconstant, even on the same plant, that I doubt very much if the local collections are specifically distinct from *M. microcarpum*.

130. CHIONOSTOMUM C. M.

Chionostomum C. M., Linnæa 36 (1870-1871) 21.

Golden-green glossy plants in dense tufts. Stems creeping, irregularly pinnate. Leaves ovate-lanceolate, deeply concave, short-acuminate, ecostate; cells oval-rhomboidal, longer below, large and inflated at basal angles. Seta long, smooth; capsule large, erect or inclined, cylindric; peristome double, teeth smooth below, endostome more or less adherent to teeth, with narrow segments from a low basal membrane; lid long and slenderly beaked.

CHIONOSTOMUM ROSTRATUM (Griff.) C. M. Plate 24, fig. 411.

Chionostomum rostratum (Griff.) C. M., Linnaea 36 (1870-1871) 21.
Neckera rostrata GRIFF., Not. 456; Ic. Pl. Asiat. 2 (1849) *pl. 87. fig. 1.*

Autoicous; rather robust plants. Stems elongate, closely and irregularly pinnate, branches densely foliate, tumid and blunt. Leaves laxly erect when dry, more spreading when moist, oblong-lanceolate, short-acuminate, deeply concave, lightly plicate, ecostate, 2 to 2.5 mm long, 0.7 mm wide; margins entire, slightly reflexed in upper half; cells narrowly rhomboidal, smooth, 5 to 6 μ wide and 6 to 8 times as long, gradually longer and narrower below, shorter and colored across insertion, alar cells about 5, large and inflated, pale yellow. Seta 2 to 2.5 cm long, slender, red, smooth; capsule cylindric, erect or slightly inclined, urn 2.5 mm long; peristome teeth nearly 0.5 mm long, pale yellow, papillose toward tips and on inner face, nearly or quite smooth on outer face below, segments of endostome filiform from a low basal membrane; lid 1.6 mm long, slenderly beaked from a conical base; calyptra cucullate, extending nearly halfway down capsule; spores smooth, 12 to 14 μ.

LUZON, Benguet Subprovince, Baguio, *Williams 1734.*

Distribution: Sikkim, Khasia, Coorg, Ceylon.

On barks and leaves. These plants are richly fruited and show the peristome structure in excellent detail. The leaves are more slenderly acuminate than figured by Brotherus, but this is probably a minor difference.

151. Genus BROTHERELLA Loeske

Brotherella LOESKE, Stud. (1910) 175.

Rather slender glossy plants in dense tufts. Stems elongate, pinnately branched. Leaves falcate-secund, ovate, acuminate, ecostate; cells narrowly linear, smooth, large and inflated at basal angles. Seta long and slender; capsule horizontal, exothecial cells not collenchymatous; peristome double; lid obliquely conic-rostrate.

BROTHERELLA LUZONENSIS (Broth.) Fleisch. Plate 21, fig. 413.

Brotherella luzonensis (Broth.) FLEISCH., Laubmfl. Java 4 (1917) 1245.
Stereodon luzonensis BROTH., Philip. Journ. Sci. § C 3 (1908) 28.

Dioicous; golden-yellow glossy plants, densely tufted. Stems creeping, irregularly divided, divisions ascending, closely pinnate, upper branches gradually shorter, densely foliate, hooked at tips. Leaves falcate-secund, ecostate, concave, short-acuminate, about 1.25 mm long, minutely denticulate in upper half; cells linear, smooth, 3 to 4 μ wide and 12 to 15 times as long, shorter and bright yellow across insertion, abruptly enlarged and inflated at basal angles forming a conspicuous alar group of 3 or 4 pale yellow cells. Seta about 2.5 cm long, slender, red; capsule horizontal, urn 2 mm long, slightly gibbous, exothecial cells with uniformly thickened walls, not collenchymatous; peristome teeth brown, densely striolate; lid about 1 mm long, obliquely rostrate from a conical base.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4938* (type); Tonglon, *Merrill 7858*: Bontoc Subprovince, *Vanoverbergh 783*.

Endemic.

An attractive, brightly colored moss well marked by the falcate-secund leaves with large alar cells.

152. Genus WARBURGIELLA C. M.

Warburgiella C. M., Monsunia 1 (1900) 176.

Slender, densely tufted, glossy plants. Stems creeping, irregularly pinnate. Leaves falcate-secund, narrowly ovate-lanceolate, long-acuminate, sharply serrate above, ecostate; cell elongate, mostly smooth, large and inflated at basal angles. Seta slender; capsule inclined or horizontal, cylindric; lid with a fine needlelike beak; calyptra large, campanulate, laciniate at base.

It seems logical to limit this genus to plants having a campanulate, laciniate calyptra as Dixon has remarked.

Key to the species of Warburgiella.

Leaves over 1.5 mm long, setæ smooth........................ 1. *W. cupressinoides*.
Leaves under 1.25 mm long, setæ pustulose above........ 2. *W. philippinensis*.

1. WARBURGIELLA CUPRESSINOIDES C. M. Plate 24, fig. 434.

Warburgiella cupressinoides C. M., Monsunia 1 (1900) 176.

Autoicous; yellowish-green, slightly glossy plants in dense, soft, silky mats. Stems creeping, densely and irregularly bipinnate, branches hooked at tips. Leaves falcate-secund, concave, narrowly oblong-lanceolate, gradually contracted to a long, filiform, slightly twisted, strongly serrate acumen, ecostate, to 2 mm long and 0.3 mm wide; cells smooth or unipapillate above, linear, 4 to 5 μ wide and 8 to 10 times as long, yellowish across insertion, alar cells 3 or 4, large and inflated, hyaline or pale yellow. Perichætial leaves abruptly narrowed to a long, filiform, serrate acumen; seta 1.5 to 2 cm long, red, smooth, curved at tip; capsule horizontal, urn 1.5 mm long; peristome teeth yellow, striolate, with a narrow median furrow; lid with a slender, fine beak as long as urn; calyptra large, extending to base of urn, campanulate, laciniate at base.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 3167*; Mount Pulog, *Curran, Merritt, & Zschokke 16413*. MINDORO, Mount Halcon, *Merrill 5596, 6192* in part. PANAY, Antique Province, *McGregor 32644*. MINDANAO, Bukidnon Province, Tangculan, *Ramos and Edaño 37170*.

Distribution: New Caledonia.

On trees and logs. These collections show some variation in size but the large, campanulate calyptræ in connection with the filiform, pointed, curved leaves and nearly smooth cells will serve to separate them from *Trichosteleum*.

2. WARBURGIELLA PHILIPPINENSIS (Williams) Broth. Plate 34, fig. 415.

Warburgiella philippinensis (Williams) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 429.

Rhaphidostegium philippinense WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 371.

Very similar in habit, color, and structural details to *W. cupressinoides*, but smaller and more delicate. Leaves to 1.2 mm long and 0.12 mm wide, minutely serrulate above. Seta 10 to 14 mm long, slightly pustulate toward tip.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 3166*.

Endemic.

On decayed wood. I think this will prove to be a small form of *W. cupressinoides*. The only distinctions are in the smaller weakly toothed leaves and the slightly roughened setæ. The peristome teeth show a narrow median furrow.

153. Genus SEMATOPHYLLUM Mitt.

Sematophyllum MITT., Journ. Linn. Soc. (1865) 5.

Rather small, glossy plants in dense mats. Stems creeping, branches crowded, ascending, densely foliate. Leaves erect-spreading, concave, ovate-lanceolate, ecostate, entire or weakly toothed above; cells elongate, smooth, alar cells large and inflated. Seta smooth; capsule small, erect to horizontal, exothecial cells strongly collenchymatous; peristome teeth striolate, with a fine zigzag median line, segments of endostome keeled from a high basal membrane; lid long and slenderly beaked.

Key to the species of Sematophyllum.

1. Leaf cells strongly incrassate, seta to 2 cm long ..... 4. *S. microcladioides.*
   Leaf cells scarcely incrassate, seta 1 cm long or shorter .... 2.
2. Leaves narrow, gradually subulate-acuminate .... 3. *S. saproxylophilum.*
   Leaves broad, abruptly acuminate .... 3.
3. Leaves slenderly acuminate, cells linear .... 2. *S. luzonense.*
   Leaves short-acuminate, cells rhomboidal .... 1. *S. tristiculum.*

1. **SEMATOPHYLLUM TRISTICULUM** (Mitt.) Fleisch. Plate 14, fig. 416.

Sematophyllum tristiculum (Mitt.) Fleisch., Laubmfl. Java 4 (1923) 1262.

Stereodon tristiculus Mitt., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 102.

Autoicous; slightly less robust than *S. luzonense.* Branches widely spreading, not noticeably curved. Leaves slightly homomallous, broadly ovate, concave, abruptly acuminate, 1 to 1.2 mm long, up to 0.5 mm wide, entire; cells linear-rhomboidal, 6 to 8 µ wide and 5 to 10 times as long, shorter in acumen and colored across insertion, alar cells oval, slightly inflated, pale yellow, supra-alar cells few, subquadrate. Perichætial leaves gradually and rather broadly acuminate; seta 7 to 10 mm long; capsule suberect or inclined, oblong-ovoid, urn 1 to 1.4 mm long.

MINDANAO, Lanao Province, Palao Amopo, *Bartlett 15984, 16025.*

Distribution: Khasia, Assam, Ceylon, Annam, Sumatra, Java.

The distinctions between this species and *S. luzonense* are slight but apparently consistently maintained. In *S. tristiculum* the branches are only slightly curved, the leaves are not conspicuously homomallous, the leaf apex is uniformly shorter and broader, and the cells are appreciably wider and less pellucid.

2. **SEMATOPHYLLUM LUZONENSE** (Broth.) Broth. Plate 21, fig. 417.

Sematophyllum luzonense (Broth.) Broth., E. & P. Pflanzenfam. ed. 2 11 (1925) 431.

Rhaphidostegium luzonense Broth., Philip. Journ. Sci. § C 13 (1918) 220.

Autoicous; relatively robust, yellowish green, glossy plants in dense tufts or mats. Stems elongate, radiculose, densely branched, branches curved, ascending, blunt. Leaves crowded, homomallous, oblong-ovate, acuminate, concave, to 1.8 mm long and 0.5 mm wide; margins entire or minutely denticulate near apex, broadly recurved; cells linear with thin, pale walls, smooth, 6 µ wide and 8 to 10 times as long, alar cells large, oval, slightly inflated, golden brown, supra-alar cells subquadrate, rather numerous. Perichætial leaves subulate-acuminate, entire; seta 8 to 10 mm long, smooth; capsule minute, inclined, urn 1 mm long.

LUZON, Benguet Subprovince, *Sanchez 6, 11, Curran 15639;* Baguio, and vicinity, *Robinson 14053, Williams 1732, Bartlett 13390, 13388, 13440.*

Endemic.

On trees. Coarser than either of the following species and with considerably broader leaves. The branches are often strongly curved and the leaves conspicuously homomallous.

3. SEMATOPHYLLUM SAPROXYLOPHILUM (C. M.) Fleisch. Plate 24, fig. 418.

Sematophyllum saproxylophilum (C. M.) FLEISCH., Laubmfl. Java 4 (1918) 1260.

Hypnum saproxylophilum C. M., Syn. 2 (1851) 334.

Slender, delicate plants in dense, pale-green, glossy tufts. Stems rather short, creeping, irregularly branched. Leaves rigidly erect-spreading, narrowly lanceolate, gradually subulate-acuminate, ecostate, usually minutely denticulate near apex, to 2 mm long and 0.4 mm wide; margins nearly plane; cells linear, smooth, 5 μ wide and 12 to 15 times as long, alar cells 3 or 4, large, oval, inflated, supra-alar cells short-rhomboidal, very few. Perichætial leaves long subulate-acuminate, irregularly serrate near base of acumen; seta smooth, 6 to 8 mm long, curved at tip; capsule small, horizontal or inclined.

LUZON, Rizal Province, Antipolo, *Ramos 21341, 21342;* Mount Canumay, *Ramos 13797;* Montalban, *Bartlett 14509, 14527;* Bataan Province, Lamao River, *Williams 866;* Cagayan Province, Magapit, *Bartlett 14860;* Sitio Dabayuan, *Bartlett 14929;* Cavite Province, Silang and Balete, *Bartlett 14801;* Laguna Province, Fami, *McGregor 23273;* San Antonio, *Ramos 16673;* Caluan, *McGregor 12516.* MINDANAO, Davao Province, *Weber 1475.* JOLO, Bud Kaunayan, *Bartlett 16100.*

Distribution: Java.

On trees, often in damp bamboo forests. Readily recognized by the narrow, long-acuminate leaves with nearly plane margins and thin-walled cells.

4. SEMATOPHYLLUM MICROCLADIOIDES Broth. Plate 24, fig. 419.

Sematophyllum microcladioides BROTH., Philip. Journ. Sci. § C 8 (1913) 92.

Autoicous; slender, densely tufted, golden-yellow plants. Stems elongate, radiculose, very densely pinnate, branches suberect, short, blunt, densely foliate. Branch leaves ovate-lanceolate, concave, slenderly acuminate, erect-spreading, 1 to 1.3 mm long; margins recurved about ⅔ up, minutely denticulate above; cells linear, 2 to 3 μ wide and 14 to 18 times as long, strongly incrassate, alar cells large, inflated, pale yellow or hyaline. Perichætial leaves subulate-acuminate, sharply denticulate; seta to 2 cm long, slightly pustulose above; capsule small, inclined.

LUZON, Laguna Province, Mount Maquiling, *Bartlett 15790a*. CAMIGUIN, Babuyanes, Camiguin Volcano, *Edaño 79670*. BOHOL, *Ramos 43419*. MINDANAO, Agusan Province, *Weber 1312* (type).

Endemic.

Clearly distinguished from the allied species by the long setæ and strongly incrassate leaf cells with very narrow lumens. The golden-yellow color is nearly uniformly maintained in all the collections I have seen.

154. Genus RHAPHIDOSTICHUM Fleisch.

Rhaphidostichum FLEISCH., Laubmfl. Java 4 (1918) 1307.

Robust, glossy plants in dense deep tufts. Stems creeping, branches suberect, densely foliate, cuspidate at tips. Leaves laxly to widely spreading, oblong-ovate, concave, entire, ecostate, abruptly contracted to a long, filiform point; cells linear, smooth, large and inflated at basal angles. Seta elongate, pustulose above; capsule horizontal or pendulous; peristome double, teeth striolate; lid long and slenderly rostrate.

Key to the species of Rhaphidostichum.

Leaves 4 mm long, setæ to 3 cm long........................ 1. *R. piliferum.*
Leaves 2.5 mm long, setæ shorter........................ 2. *R. luzonense.*

1. RHAPHIDOSTICHUM PILIFERUM (Broth.) Broth. Plate 55, fig. 430.

Rhaphidostichum piliferum (Broth.) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 434.

Sematophyllum piliferum BROTH., Oefv. Finska Vet.-Soc. Foerh. 47 (1904–1905) 9.

Dioicous; robust, golden-green glossy plants. Stems elongate, creeping, radiculose, densely branched, branches ascending, 2 to 4 cm long. Leaves laxly or horizontally spreading, oblong-ovate, ecostate, concave, abruptly contracted to a long hairlike point, up to 4 mm long and 1.2 mm wide; margins erect, entire; cells linear, 4 to 5 μ wide and 15 to 20 times as long, smooth, with firm walls, shorter, porose, and colored across insertion, alar cells large, oval, inflated, brownish. Acumen of perichætial leaves denticulate; seta 2.5 to 3 cm long, red, pustulose near apex; capsule horizontal or pendulous, urn 1.5 mm long, with a short, pustulose neck; peristome teeth with a distinct median furrow, densely striolate.

LUZON, Laguna Province, Mount Banahao, *Whitford 944* (type), *Quisumbing 880*; Tayabas Province, Lucban, *Elmer 7741*. NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 67*. PANAY, Antique Province, Culasi, *McGregor 32631*. PALAWAN, Mount Manalsal, *Edaño 50876*.

Distribution: Borneo.

On trees. A handsome moss easily recognized by the abruptly piliferous leaves from a broad, concave base.

2. **RHAPHIDOSTICHUM LUZONENSE** (Broth.) Broth. Plate 25, fig. 431.

Rhaphidostichum luzonense (Broth.) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 434.

Sematophyllum luzonense BROTH., Philip. Journ. Sci. § C 13 (1918) 221.

Dioicous; rather robust plants resembling *R. piliferum* but smaller in every way. Leaves 2 to 2.5 mm long. Seta to 18 mm long, slender, very indistinctly pustulose above; capsule horizontal, urn 1 mm long; peristome teeth with a narrow median furrow; lid 1.5 mm long, with a slender, needlelike beak.

LUZON, Laguna Province, Mount Maquiling, *Robinson 17010* (type), *Bartlett 15787b, 15790, 15782a*.

Endemic.

On base of buttress roots of living trees. Apart from the smaller size and shorter setae there is practically nothing to distinguish this species from *R. piliferum*. I doubt if it will prove to be a valid species.

155. Genus ACROPORIUM Mitt.

Acroporium MITT., Journ. Linn. Soc. (1868) 182.

Plants usually robust, glossy, in dense deep tufts, rarely slender and delicate. Stems creeping, branches suberect, rather stiff, densely foliate, frequently cuspidate at tips. Leaves erect-spreading, ovate-lanceolate from a more or less cordate-auriculate base, acuminate, ecostate, entire or weakly toothed; cells linear, smooth, seldom faintly papillose, large, inflated and colored at basal angles in a sharply defined alar group. Seta slender, smooth or papillose above; capsule small, erect or inclined; peristome teeth striolate, with a narrow median furrow; lid with a fine, needlelike beak.

The numerous Malaysian species of this genus present many difficult taxonomic problems. I am by no means satisfied with the present treatment of the local plants. Until a critical study of the whole group is made the affinities of some of the closely allied species cannot be satisfactorily established.

Key to the species of Acroporium.

1. Small, delicate plants, leaves under 0.5 mm wide .... 2.
   Coarse, often robust plants, leaves over 0.5 mm wide .... 4.
2. Setæ smooth .... 1. *A. diminutum.*
   Setæ scabrous above .... 3.
3. Perichætia on primary stems, setæ coarsely papillose above.
   2. *A. lamprophyllum.*
   Perichætia on secondary stems, setæ weakly papillose above.
   3. *A. rufum.*
4. Leaves long subulate-acuminate .... 5.
   Leaves broad, short-acuminate, usually auriculate .... 7.
5. Setæ to 1 cm long .... 6. *A. sigmatodontium.*
   Setæ 2 to 3.5 cm long .... 6.
6. Dioicous, setæ smooth .... 4. *A. secundum.*
   Autoicous, setæ papillose above .... 5. *A. alto-pungens.*
7. Synoicous .... 8.
   Dioicous or autoicous .... 9.
8. Leaves horizontally spreading, setæ 1.5 to 3 cm long.
   7. *A. hermaphroditum.*
   Leaves erect-spreading, setæ 10 to 14 mm long .... 8. *A. condensatum.*
9. Leaf apex minutely recurved .... 9. *A. hamulatum.*
   Leaf apex erect .... 10.
10. Leaves falcate-secund, slenderly acuminate .... 11. *A. falcifolium.*
    Leaves more erect-spreading, short-acuminate .... 11.
11. Dioicous, setæ over 1.5 cm long .... 10. *A. stramineum.*
    Autoicous, setæ under 1.5 cm long .... 12. *A. brevipes.*

1. **ACROPORIUM DIMINUTUM** (Brid.) Fleisch. Plate 25, fig. 412.

Acroporium diminutum (Brid.) FLEISCH., Laubmfl. Java 4 (1918) 1274.

Dicranum diminutum BRID., Bryol. Univ. 1 (1826) 814.

Hypnum subulatum HAMPE, Ic. Musc. 1 (1844) *pl. 9.*

Dioicous; resembling *A. lamprophyllum* in size and coloring but usually laxer and more delicate. Leaves rigidly erect-spreading, convolute when dry, not crowded, narrowly lanceolate, to 1.5 mm long and 0.3 mm wide, gradually narrowed to a long, subtubulose point, minutely denticulate toward apex; cells linear, smooth, alar group typical. Seta 10 to 18 mm long, slender, smooth; capsule small, horizontal or subpendulous.

LUZON, Bataan Province, upper Lamao River, *Williams 859:* Benguet Subprovince, Sablang, *Fenix 12890:* Laguna Province, Mount Maquiling, *Robinson 17024, 17053, 17065, 17117, 17123, 17100, 17169:* Tayabas Province, Infanta, *Robinson 9410.* PA-

NAY, Capiz Province, Mount Bulilao, *Martelino & Edaño 35800.* MINDANAO, Davao Province, Mount Apo, *Copeland 987.*

Distribution: Sumatra, Java, Moluccas Islands.

On exposed roots and barks. In this species the leaf cells are smooth and the setæ smooth throughout. Although I have not seen the type of *H. subulatum* Hampe the description and figures obviously represent the numerous Philippine collections which appear to be identical with the Java plants referred to *A. diminutum* by Fleischer.

7. **ACROPORIUM LAMPROPHYLLUM** Mitt. Plate 25, fig. 423.

Acroporium lamprophyllum MITT., Linn. Soc. Journ. Bot. (1869) 183.
Hypnum scabrellum Bryol. Jav., Bryol. Jav. 2 (1865) 214.

Dioicous or phylloautoicous. Slender, golden-green, slightly glossy plants in dense mats. Stems creeping, elongate, closely pinnate, branches procumbent or suberect, cuspidate. Leaves narrowly lanceolate, concave, gradually narrowed to a long, subtubulose, minute denticulate point, up to 1.8 mm long and 0.3 mm wide; cells linear, 3 to 5 μ wide and 12 to 15 times as long, smooth or coarsely seriate-papillose on back, smooth near insertion, alar cells large and hyaline. Seta about 1 cm long, coarsely papillose above, smooth below; capsule inclined.

LUZON, Laguna Province, Mount Banahao, *Robinson 9810;* Camarines Sur Province, Mount Isarog, *Edaño 84226;* Mount Madooy, *Edaño 84248.* NEGROS, Occidental Negros Province, Mount Silay, *Whitford 1551,* a form with smooth leaf cells.

Distribution: Sumatra, Java, Celebes, Borneo, New Guinea, Fiji, Samoa.

On dead wood. The slender habit and setæ coarsely papillose above will adequately distinguish this species. In *A. lamprophyllum* and *A. diminutum* the setæ are produced from the main stem, while in all the other species they are borne on the secondary stems and branches.

8. **ACROPORIUM RUFUM** (Reinw. and Hornsch.) Fleisch. Plate 25, fig. 424.

Acroporium rufum (REINW. & HORNSCH.) FLEISCH., Laubmfl. Java 4 (1923) 1672.
Leskea rufa REINW. and HORNSCH., Nov. Act. Caes. Leop. Carol. 14 Suppl. 2 (1828) 716.
Acroporium Braunii (C. M.) FLEISCH., Laubmfl. Java 4 (1918) 1273.

Dioicous and pseudoautoicous; slender plants, but larger than either of preceding species. Stems elongate, branches usually hooked at tips. Leaves often slightly falcate-secund, narrowly lanceolate, slenderly acuminate, subtubulose above and minutely denticulate at tip; cells smooth or minutely papillose at apical angles. Perichætia borne on secondary stems and ultimate branches; seta slender, to 2 cm long, papillose above; capsule small, slightly inclined.

PALAWAN, Mount Gantung, *Edaño 80887, 80888;* Mount Manalsal, *Edaño 80362.* NEGROS, Oriental Negros Province, Dumaguete, *Chapman 45.*

Distribution: Sumatra, Java, Celebes, Borneo.

The Palawan plants represent a robust form with leaves up to 3 mm long, rigidly erect spreading and not at all secund; the setæ are scarcely 1 cm long and papillose above.

4. ACROPORIUM SECUNDUM (Reinw. and Hornsch.) Fleisch. Plate 35, fig. 42a.

Acroporium secundum (Reinw. & Hornsch.) FLEISCH., E. & P. Pflanzenfam. ed. 1 Musci (1909) 1122.

Leskea secunda REINW. & HORNSCH., Nov. Act. Caes. Leop. Carol. 14 Suppl. 2 (1829) 717.

Sematophyllum tubulosum BROTH., Philip. Journ. Sci. § C 8 (1913) 94.

Dioicous; rather robust, glossy, yellowish-green or brown plants in deep tufts. Stems irregularly branched, branches cuspidate and frequently hooked at tips. Leaves widely spreading, often secund, ovate-lanceolate from a cordate-auriculate base, long-acuminate, usually subtubulose above, entire or minutely denticulate at apex, to 3 or 3.5 mm long and about 1 mm wide; cells linear, slightly porose, smooth. Seta 2.5 to 3 cm long, typically smooth; capsule small, inclined.

LUZON, Laguna Province, Mount Maquiling, *Baker 3663;* Camarines Sur Province, Mount Potianay, *Edaño 84271.* NEGROS, Canlaon Volcano, *Merrill 6819, 6826;* Oriental Negros Province, Cuerno de Negros, *Mogdamo 99, 103.* MINDANAO, Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4796.*

Distribution: Sumatra, Java, Borneo, Celebes, Ceram.

A variable species typified by the long, smooth setæ and dioicous inflorescence. The original collections of *Sematophyllum tubulosum* Broth. show setæ up to 3 cm long and rather narrower leaves of variable width. I should think this form could be safely included in Fleischer's var. *angustifolium.*

5. ACROPORIUM ALTO PUNGENS (C. M.) Broth. Plate 35, fig. 42b.

Acroporium alto-pungens (C. M.) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 437.

Hypnum alto-pungens C. M., Linnaea 37 (1872) 179.

Autoicous; robust plants resembling *A. secundum* in size, habit, and coloring. Leaves widely spreading, 3 to 3.5 mm long, 1 mm wide, long-acuminate, entire, subtubulose above. Seta 2 to 3.5 cm long, slightly papillose above; capsule horizontal, urn 1.5 mm long.

LUZON, Bataan Province, Mount Mariveles, *Williams 876*, *Whitford 230*: Laguna Province, Mount Banahao, *Ramos 19593*, *Whitford 943*, *Robinson 6557*, *6601*, *Copeland 824*, Mount Maquiling, *Robinson 17315*. NEGROS, Canlaon Volcano, *Merrill 6807*, *6811*, *6824*: Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 9995*; Cuerno de Negros, *Magdamo 46*, *65*, *71*, *97*. MINDANAO, Agusan Province, Cabadbaran, *Elmer 14108*. CAMIGUIN DE MINDANAO, *Ramos 14803*, *14902*.

Endemic.

On trees. Closely allied to *A. secundum* in most particulars, but possibly distinct in the autoicous inflorescence and the setæ consistently scabrous above.

6. ACROPORIUM SIGMATODONTIUM (C. M.) Fleisch. Plate 25, fig. 437.

Acroporium sigmatodontium (C. M.) FLEISCH., Laubmfl. Java 4 (1923) 1281.

Hypnum sigmatodontium C. M., Syn. 2 (1851) 637.

Usually synoicous; medium-sized, rather slender plants in dense tufts, golden-green, glossy. Stems irregularly and densely branched, branches laxly erect, to 4 cm long, cuspidate and more or less curved at tips. Leaves crowded, slightly secund, ovate-lanceolate, slenderly and sharply acuminate, concave, entire, slightly tubulose toward apex, up to 2.5 mm long and 0.7 mm wide; cells linear, alar group typical. Seta slender, 6 to 10 mm long, papillose above; capsule minute, inclined, scarcely 1 mm long.

LUZON, Benguet Subprovince, Baguio, *Williams 1726*, *Merrill 7830*: Bontoc Subprovince, Bauco, *Vanoverbergh 3967*: Sorsogon Province, Irosin, Mount Bulusan, *Elmer 17382*. PANAY, Capiz Province, Mount Bulilao, *Martelino and Edaño 35794*, *35798*, *35799*, *35801*, *35803*, *35813*.

Distribution: Ceylon, Sumatra, Java, New Guinea, Tahiti.

On trees. In this species the short setæ are exceeded by the tips of the branches. It is slenderer and laxer than *A. secundum* and is usually richly fruited.

ACROPORIUM SIGMATODONTIUM (C. M.) Fleisch. var. ROBINSONII (Broth.) Bartram comb. nov.

Sematophyllum Robinsonii BROTH., Philip. Journ. Sci. 13 C 8 (1918) 95.

Inflorescence autoicous.

LUZON, Laguna Province, Mount Banahao, *Robinson 9300.*

These plants are typical in every respect but the inflorescence, which is autoicous. Without any other correlating characters I cannot believe that this form is deserving of more than a varietal rank.

ACROPORIUM SIGMATODONTIUM (C. M.) Fleisch. var. BRACHYPODIUM (Dix.) Bartram comb. nov.

Acroporium brachypodum Dix. in herb.

Leaves slightly secund, narrowly ovate-lanceolate, to 3 mm long and nearly 1 mm wide. Seta 4 to 6 mm long, slightly pustulose above; capsule slightly inclined.

LUZON, Laguna Province, Summit of Mount Maquiling, *Herklots 321.*

This form differs from the type only in the shorter setæ and in the longer leaves.

7. ACROPORIUM HERMAPHRODITUM (C. M.) Fleisch. Plate 25, fig. 428.

Acroporium hermaphroditum (C. M.) FLEISCH., Laubmfl. Java 4 (1919) 1292.

Hypnum hermaphroditum C. M., Syn. 2 (1851) 388, 689.

Synoicous; robust, golden-green plants in deep tufts. Stems irregularly branched, branches with erect, sharply cuspidate tips. Leaves crowded, widely spreading on all sides, oblong-ovate from a broad cordate-auriculate base, short-acuminate, entire, up to 2.5 mm long and 1 mm wide; margins inflexed; cells linear, incrassate, porose, alar group deep brown. Seta to 3 cm long, pustulose above; capsule inclined, urn 1 mm long.

BATAN, Mount Iraya, *Ramos 79819.* LUZON, Rizal Province, Oriud, *Loher 15173;* Bontoc Subprovince, Mount Pukis, *Ramos & Edaño 38266* in part; Laguna Province, Mount Maquiling, *Robinson 17098, 17116, Robinson & Brown 17319;* Mount Banahao, *Copeland "AE."* MINDANAO, Davao Province, Mount Apo, *Williams 2661.* CAMIGUIN DE MINDANAO, *Ramos 14901.*

Distribution: Sumatra, Java, Celebes, Moluccas, New Caledonia, New Guinea.

On trees. Well characterized by the divaricately spreading short-acuminate leaves, long setæ, and synoicous inflorescence.

8. ACROPORIUM CONDENSATUM (C. M.) Bartram comb. nov. Plate 25, fig. 429.

Pungentella condensata C. M., Micholitz M. Philip. No 180.

Synoicum. *A. hermaphrodito* (C. M.) forsan proximum, differt foliis erecto-patentibus; seta breviora, 10 to 14 mm alta.

Synoicous; less robust than *A. hermaphroditum*, yellowish green, glossy, in dense compact cushions; branches not or indis tinctly cuspidate. Leaves crowded, erect-spreading; not divaricate, ovate-lanceolate from an auriculate base, short-acuminate, concave, entire, apex minutely toothed; cells linear, very slightly porose. Perichætial leaves abruptly acuminate, denticulate; seta 10 to 14 mm long, coarsely papillose above; capsule suberect, urn scarcely 1 mm long.

LUZON, Benguet Subprovince, *Sanchez 12;* Baguio, *Bartlett 13332, 13333, 13348.*

Endemic.

On pine trunks. Allied to *A. hermaphroditum* through the synoicous inflorescence but smaller, more compactly tufted and quite different in the tumid branches with the leaves suberect and only slightly spreading. The shorter setæ, coarsely papillose above, are also distinctive.

The few fragments from the Micholitz collection that I have seen are representative of this species as I interpret it, but there seems to be some *Sematophyllum luzonense* Broth. in the mixture. As there was no description published that I am aware of, the status of *Pungentella condensata* C. M. is rather questionable.

9. ACROPORIUM HAMULATUM Fleisch. Plate 25, fig. 430.

Acroporium hamulatum FLEISCH., Laubmfl. Java 4 (1918) 1294.

Dioicous; robust plants resembling *A. hermaphroditum.* Leaves widely spreading, usually minutely recurved at extreme apex. Perichætial leaves about 1.5 mm long, bluntly pointed, denticulate above. Seta 16 mm long, slightly pustulose above; capsule inclined, urn barely 1 mm long.

LUZON, Laguna Province, Mount Maquiling, *Herklots P. 10, P. 16.*

Distribution: Sumatra, Java.

The recurved leaf tip is rather a subtle character, but it can be demonstrated with careful examination. Although this species is similar in most respects to *A. hermaphroditum,* the dioicous inflorescence and the leaf tip seem to be good diagnostic characters.

10. ACROPORIUM STRAMINEUM (Reinw. and Hornsch.) Fleisch. Plate 25, fig. 431.

Acroporium stramineum (Reinw. & Hornsch.) FLEISCH., Laubmfl. Java 4 (1918) 1901.

Leskea straminea REINW. & HORNSCH., Nov. Act. Caes. Leop. Carol. 14 Suppl. 2 (1826) 718.

Hypnum hyalinum REINW. in Schwaegr. Suppl. 3 pt. 1 fasc. 2 (1828) *pl. 227b.*

Sematophyllum batanense BROTH., Philip. Journ. Sci. § C 8 (1913) 96.

Dioicous and pseudoautoicous; medium-sized plants, densely tufted, golden green, glossy. Stems decumbent, irregularly branched. Leaves laxly erect-spreading, often slightly secund, ovate-lanceolate, from a slightly auriculate base, short-acuminate, entire, slightly concave, not or scarcely tubulose at apex, 2 to 2.5 mm long and 1 mm wide; cells linear, incrassate, more or less pitted. Perichaetial leaves narrowed to a short denticulate acumen; seta slender, 1.5 to 2 cm long, papillose above; capsule suberect.

BATANES, *Fenix 3856*. LUZON, Bataan Province, Mount Mariveles, *Merrill 3541, 3546, 3682, Borden 711, Williams 3168;* upper Lamao River, *Williams 874;* Benguet Subprovince, between Baguio and Sablan, *Williams 1725;* Mount Santo Tomas, *Bartlett 13284a;* Pampanga Province, Mount Arayat, *Ramos 22449;* Laguna Province, Mount Maquiling, *Baker 2763, Robinson 17054, 17076, 17084*. MINDORO, Puerto Galera, *Bartlett 13568a*. NEGROS, Occidental Negros Province, Mount Marapara, *Curran & Foxworthy 13646*. MINDANAO, Davao Province, Mount Apo, *Copeland 1086*. CAMIGUIN DE MINDANAO, *Ramos 14008*.

Distribution: Java, Banca, Borneo, Celebes, New Guinea.

On trees. The short-acuminate, erect-spreading leaves, not or very slightly secund and not conspicuously cuspidate in the comal tufts, may be useful in establishing the identity of this species. It is less robust than *A. hermaphroditum* and the stems lack the bristly appearance of that species. *S. bataanense* Broth. seems to differ in no essential particular. The pseudoautoicous inflorescence alone is certainly not a distinctive character.

11. ACROPORIUM FALCIFOLIUM Fleisch. Plate 35, fig. 431.

Acroporium falcifolium FLEISCH., Laubmfl. Java 4 (1918) 1256.

Pseudoautoicous; golden-green glossy plants in dense deep tufts. Stems ascending, irregularly branched. Leaves falcate-secund, ovate-lanceolate from a broad, cordate-auriculate base, slenderly acuminate, to 3 mm long and 1 mm wide, subtubulose toward apex by incurved entire margins; cells linear, incrassate, pitted. Seta 1.5 to 2 cm long, pustulose above; capsule small, slightly inclined.

LUZON, Tayabas Province, Infanta, *Robinson 9874;* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16298*. MINDORO, Mount Halcon, *Merrill 5705*.

Distribution: Sumatra, Java, Borneo, Celebes.

On trees. The Mindoro plants are well characterized by the strongly falcate-secund leaves, but this feature is less obvious in the Luzon collections. As both *A. stramineum* and *A. secundum* are quite polymorphous it may prove practicable to unite *A. falcifolium* with one or the other in a final analysis.

12. **ACROPORIUM BREVIPES** (Broth.) Broth. Plate 24, fig. 13).

Acroporium brevipes (Broth.) BROTH., E. & P. Pflanzenfam. ed. 2 11 (1925) 437.

Sematophyllum brevipes BROTH., Philip. Journ. Sci. § C 8 (1913) 95.

Autoicous; slender, yellowish-green plants in dense, rather flat mats. Stems irregularly branched, branches ascending, slightly cuspidate. Leaves erect-spreading, ovate-lanceolate, short-acuminate, concave, to 2 mm long and 0.7 mm wide; margins entire, narrowly inflexed toward apex; cells linear with firm pale walls, alar group yellow or hyaline. Seta 8 to 12 mm long, slightly pustulose above; capsule small, suberect, urn 1 mm long.

LUZON, Benguet Subprovince, San Fernando Trail, *Merrill 7865*; Baguio, *Williams 1727*.

Endemic.

On trees and ledges. Quite similar to the smaller forms of *A. stramineum* but apparently separable by the autoicous inflorescence and the shorter setæ.

156. Genus TRICHOSTELEUM (Mitt.) Jaeg.

Trichosteleum (Mitt.) JAEG., Adumbr. 2 (1876–1877) 477.

Sematophyllum § 3 *Trichosteleum* MITT., Journ. Linn. Soc. 12 (1869) 477.

Small or medium-sized plants, densely matted. Stems creeping, mostly irregularly branched. Leaves often more or less falcate-secund, ovate-lanceolate, long-acuminate, concave, ecostate, usually toothed above; cells linear or elliptic, papillose, rarely smooth, large and inflated at basal angles. Seta slender, nearly always papillose above; capsule subcylindric, usually pendulous; peristome teeth striolate, furrowed along median line; lid with a long needlelike beak; calyptra cucullate, naked.

Key to the species of Trichosteleum.

1. Leaf cells pluripapillate .... 2.
   Leaf cells unipapillate .... 3.
2. Minute plants, leaves erect .... 1. *T. elegantissimum.*
   Larger plants, leaves falcate-secund .... 2. *T. hamatum.*
3. Leaves less than 0.25 mm wide, falcate-secund .... 4.
   Leaves over 0.4 mm wide, complanate .... 5.
4. Leaves deeply concave, abruptly acuminate .... 3. *T. brevisetum.*
   Leaves slightly concave, gradually acuminate .... 4. *T. bistrumosum.*

5. Leaf cells smooth or faintly papillose........................ 5. *T. complanatulum.*
   Leaf cells coarsely papillose.. 6.
6. Capsule papillose .... 6. *T. mindanense.*
   Capsule smooth .... 7. *T. Boschii.*

1. TRICHOSTELEUM ELEGANTISSIMUM Fleisch. Plate 25, fig. 434.

Trichosteleum elegantissimum FLEISCH., Laubmfl. Java 4 (1918) 1326.

Autoicous; minute plants, dull yellowish green in dense short tufts. Stems creeping, closely branched, branches short, 3 to 4 mm long. Leaves erect or lightly curved, narrowly lanceolate, long-acuminate, concave, denticulate above, to 1.2 mm long and 0.25 mm wide, ecostate; cells narrowly rhomboidal, 4 to 5 μ wide and 5 to 7 times as long, strongly seriate papillose over lumens, alar cells large, inflated, hyaline. Seta curved at tip, 4 to 5 mm long, smooth below, coarsely papillose above; capsule small, pendulous.

PALAWAN, Mount Mantalingahan, *Edaño 80848.*

Distribution: Sumatra, Java.

On dead wood. The small size, straight leaves, and shorter setæ of this species will distinguish it from any of the forms of *T. hamatum* to which it is obviously allied.

2. TRICHOSTELEUM HAMATUM (Doz. and Molk.) Jaeg. Plate 25, fig. 435.

Trichosteleum hamatum (Doz. & Molk.) JAEG., Adumbr. 2 (1876–1877) 486.

Hypnum hamatum DOZ. & MOLK., Ann. Sci. Nat. (1844) 307; Musc. Frond. Archip. Ind. (1844) 11.

? *Hypnum Palauense* HAMPE, Linnæa 38 (1874) 567.

Autoicous; variable plants in dense intricate tufts or mats, pale or lurid green, slightly glossy. Stems creeping, irregularly branched, branches decumbent or ascending, usually hooked at tips. Branch leaves crowded, more or less falcate-secund, gradually lanceolate-acuminate from a concave-ovate base, ecostate, to 2.2 mm long and 0.5 mm wide, often smaller; margins erect, sharply serrate in upper half; cells linear or narrowly elliptic, about 5 μ wide and 6 to 10 times as long, more or less pitted and incrassate, strongly pluripapillate with a row of papillæ over lumens, alar cells 2 to 3, large, inflated, hyaline. Perichætial leaves abruptly long-acuminate, sharply toothed; seta slender, 1 to 1.5 cm long, coarsely papillose above, smooth below; capsule small, ovoid, horizontal or pendulous; lid slenderly beaked, longer than urn.

Common on trees and logs in damp forests.

Distribution: Wide, from Malaysia through the Pacific islands to Hawaii.

A very protean species, but usually recognized without difficulty by the falcate-secund leaves, the cells seriate-papillose over the lumens, and the setæ papillose above. I doubt if the variety *semimamillosum* C. M. can be segregated with any satisfaction; the setæ are typically smooth below and always papillose for some distance below the tip. *Hypnum palanense* Hampe probably represents one of the forms of *T. hamatum*. In the description there is nothing suggestive of a distinct species.

3. **TRICHOSTELEUM BREVISETUM** Broth. Plate 25, fig. 426.

Trichosteleum brevisetum BROTH., Philip. Journ. Sci. § C 8 (1913) 93.

Autoicous; slender, yellowish plants in dense mats, slightly glossy. Stems creeping, closely pinnate, branches short, curved, slightly hooked at tips. Leaves falcate secund, crowded, narrowly ovate-lanceolate, to 1.4 mm long and 0.2 mm wide, deeply concave, abruptly narrowed to a long, linear-filiform, strongly toothed point often nearly as long as blade; cells linear, with firm walls, 3 to 5 μ wide and 10 to 14 times as long, frequently with a single low papilla over lumens, alar cells usually 2, large, inflated, thick-walled. Seta smooth, 12 to 20 mm long; capsule small, horizontal, urn scarcely 1 mm long; lid with a slender, oblique beak as long as urn.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4983, 4997*; Mount Tonglon, *Merrill 7822, 7860*; Pauai, *McGregor 8707*; Bontoc Subprovince, *Vanoverbergh 1314*. MINDANAO, Davao Province, Mount Apo, *Copeland 1086*.

Endemic.

On trees. Slightly smaller and more delicate than *T. leptocarpon* (Schwaegr.) and with consistently shorter setæ. This may prove to be a distinction without a difference, but at any rate the local collections are uniform in these particulars. The plants are often mixed with and closely resemble *T. hamatum*, but they may be distinguished, even with a hand lens, by the slenderer habit and smooth setæ.

4. **TRICHOSTELEUM BISTRUMOSUM** (C. M.) Jaeg. Plate 26, fig. 433.

Trichosteleum bistrumosum (C. M.) JAEG., Adumbr. 2 (1876–1877) 487.

Hypnum bistrumosum C. M., Linnæa 38 (1874) 586.

Autoicous; slender plants resembling *T. brevisetum.* Leaves narrowly ovate-lanceolate, slightly concave, gradually narrowed to a long, fine, flat, denticulate point, to 1.3 mm long; cells linear, firm, smooth or with a single large tuberculate papilla over lumens, alar cells as in *T. brevisetum.* Seta about 12 mm long, slightly pustulose above; capsule pendulous, cylindric.

LUZON, reg. montosa, *Wallis.*

Endemic.

Although near *T. brevisetum,* this species seems to be well marked by the less concave, more gradually acuminate leaves, the more strongly papillose leaf cells, and the seta slightly scabrous above. The fragment from the original collection which I have seen is very inadequate, and the species may eventually have to be united with *T. brevisetum* or *T. leptocarpon.*

5. TRICHOSTELEUM COMPLANATULUM (Dix.) Bartram comb. nov. Plate 26, fig. 438.

Warburgiella complanatula DIX. sp. nov., in herb.

Autoicum. Sat robustum; *T. Boschii* (Doz. & Molk.) forsan proximum, differt foliis magis complanatis, cellulis sublaevibus, dorso humiliter unipapillosis.

Autoicous; relatively robust plants in dense mats, golden green with a metallic lustre. Stems creeping, closely and irregularly pinnate, branches decumbent, up to 1.5 cm long, strongly complanate-foliate. Leaves oblong-lanceolate, long-acuminate, concave, escostate, to 2.5 mm long 0.5 mm wide; margins erect, serrate in upper half; cells linear, thin-walled, 5 to 6 μ wide, smooth or with a single low papilla over lumens on dorsal side, alar cells 2 or 3, large, inflated, reddish brown. Seta 7 to 8 mm long, slender, curved and papillose at tip; capsule minute, pendulous, exothecial cells mamillose; calyptra (as seen) cucullate.

LUZON, Rizal Province, *Edaño 75069.*

Endemic.

On rotten wood. A curious species, widely distinct from any of its allies in the nearly smooth leaf cells. The papillæ are low and visible only in profile on the dorsal side. If the calyptræ are cucullate, as they appear to be from fragments in the tufts, the species suggests a possible remote alliance with *T. Boschii* (Doz. & Molk.).

6. TRICHOSTELEUM MINDANENSE Broth. Plate 26, fig. 439.

Trichosteleum mindanense BROTH., Philip. Journ. Sci. § C 8 (1913) 94.

Autoicous; slender, dull yellowish-green plants in low tufts. Stems creeping, closely pinnate, branches short, laxly spreading, complanate-foliate. Leaves erect-spreading, ovate-lanceolate, gradually acuminate, concave, scarcely 1 mm long and 0.4 mm wide; margins erect, serrulate above; cells linear, 3 to 4 μ wide and 6 to 10 times as long, strongly unipapillate, alar cells typical. Perichætial leaves subulate-acuminate, serrulate, usually incised on each side at base of acumen; seta 6 to 8 mm long, curved and papillose at tip, smooth below; capsule minute, ovoid, exothecial cells strongly mamillose.

NEGROS, Oriental Negros Province, Dumaguete, *Chapman 82*. MINDANAO, Zamboanga Province, *Merrill 8355* (type).

Endemic.

Evidently closely related to *T. mammosum* (C. M.) but apparently distinct in the setæ being papillose only near the tip and in the incised perichætial leaves.

7. TRICHOSTELEUM BOSCHII (Doz. and Molk.) Jaeg. Plate 26, fig. 140.

Hypnum boschii (Doz. & Molk.), Ann. Sci. Nat. 4 (1844) 306.

Trichosteleum boschii (Doz. & Molk.) JAEG., Adumbr. 2 (1876–1877) 487.

Trichosteleum basilanense BROTH., Philip. Journ. Sci. § C 13 (1918) 220.

Autoicous; slender to relatively robust plants in dense low tufts, yellowish green, slightly glossy. Stems elongate, creeping, dark brown, irregularly pinnate, branches laxly ascending, complanate-foliate. Branch leaves ovate-lanceolate, slightly concave, gradually or often abruptly long-acuminate, ecostate, to 2 mm long and 0.5 mm wide; margins more or less reflexed and undulate above, serrulate in upper half; cells linear-rhomboidal, thin-walled, 4 to 5 μ wide and 12 to 20 times as long, with a single large papilla over lumen on dorsal side, smooth below, alar cells large, inflated, reddish brown. Seta 8 to 14 mm long, curved and papillose at tip, smooth below; capsule small, horizontal or pendulous, exothecial cells smooth.

PALAWAN, Mount Mantalsal, *Edaño 80874*. PANAY, Capiz Province, Libacao, *Martelino & Edaño 35707, 35772, 35776*. MINDANAO, Zamboanga Province, *Whitford & Hutchinson 9283*. BASILAN, *Reillo 16268*.

Distribution: Malay Peninsula, Siam, Sumatra, Java, Annam, Borneo, Fiji.

On dead wood. A rather variable species in size and leaf form which I think may safely include *T. basilanense* Broth.

157. Genus ACANTHORRHYNCHIUM Fleisch.

Acanthorrhynchium FLEISCH., Laubmfl. Java 4 (1919) 1331.

Slender plants in extensive, flat mats. Stems creeping, closely pinnate, branches complanate-foliate. Leaves ovate, long filiform-acuminate, ecostate, serrulate all around. Cells oval-rhomboidal, unipapillate, large and inflated at basal angles. Perichætium large; seta long, smooth; capsule inclined or horizontal, gibbous; lid short, conical; peristome double, as in *Taxithelium*.

ACANTHORRHYNCHIUM PAPILLATUM (Harv.) Fleisch. Plate 26, fig. 443.

Acanthorrhynchium papillatum (Harv.) FLEISCH., Laubmfl. Java 4 (1919) 1331.

Hypnum papillatum HARV., Hook. Ic. Pl. Rar. 1 (1837) *pl. 24, fig. 3;* Lond. Journ. Bot. (1840) 18.

Autoicous and synoicous; slender, yellowish-green plants, without lustre, in extensive intricate mats. Stems elongate, creeping, usually closely pinnate or twice pinnate, branches short, widely spreading, procumbent, complanate-foliate. Branch leaves ovate, rather abruptly narrowed to a long filiform point, concave, serrulate to base, contracted to insertion, to 1.3 mm long and 0.4 mm wide; cells oval-rhomboidal, with firm walls, 4 to 5 µ wide and 4 to 8 times as long, with a single small but distinct papilla on dorsal side over lumen, narrower toward middle of leaf and shorter toward margins, inflated alar cells 3 or 4, pale yellow or hyaline. Inner perichætial leaves erect, 2.5 mm long, gradually narrowed to a long, coarsely serrate point; seta red, smooth, to 3 or 3.5 cm long; capsule horizontal, curved and gibbous on back, urn 1.5 mm long; lid short, conical, 0.5 mm long.

LUZON, Cagayan Province, Tamidagan River, *Edaño*, numerous collections; Kilingkiling, *Edaño 79749, 79752, 79763;* Mount Caboloan, *Edaño 80923;* Zambales Province, *Ramos 6139:* Tayabas Province, Tagcauayan, *Foxworthy 13099;* Baler, *Santos 355b, 221, 287.* NEGROS, Occidental Negros Province, Cadiz, *Celestino 7359;* Gimagaan River, *Whitford 1568.* MINDANAO, Zamboanga Province, Port Banga, *Whitford & Hutchinson 9920.* BILIRAN, *McGregor 18460, 18469.*

Distribution: Nepal, Siam, Malay Peninsula, Sumatra, Java, Borneo, New Guinea, Fiji, Samoa.

On trees and logs. Variable, but usually well marked by the flattened branches and small hair-pointed leaves with unipapillate cells. In fruit the long, smooth setæ and curved, asymmetrical capsules with short, conical lids are quite characteristic.

158. Genus TAXITHELIUM Spruce

Taxithelium SPRUCE, Catal. (1867).

Mostly autoicous. Slender, usually corticolous plants in thin mats or tufts. Stems creeping, more or less regularly pinnate, branches complanate-foliate. Leaves ovate or ovate-lanceolate, short or long-acuminate, usually minutely toothed above, lateral rows spreading and asymmetrical, dorsal and ventral rows slightly smaller and more appressed, ecostate or nearly so; cells linear, seriate-papillose over lumens, rarely smooth, usually differentiated at basal angles. Perichætium small; seta elongate, smooth; capsule ovoid, inclined or horizontal; peristome double, teeth striolate, with a slender zigzag median line, endostome with a high basal membrane; lid conical, short.

Key to the species of Taxithelium.

1. Leaves short-pointed, not or scarcely acuminate........ 2.
Leaves long and slenderly acuminate........ 5.
2. Leaf cells faintly papillose........ 1. *T. Merrillii.*
Leaf cells strongly papillose........ 3.
3. Leaves minutely crenulate, alar cells not inflated, usually hyaline.
4. *T. nepalense.*
Leaves sharply toothed, alar cells inflated and often colored........ 4.
4. Dull plants, leaves ovate, short-pointed........ 2. *T. instratum.*
Glossy plants, leaves broader and more abruptly pointed.
5. *T. Gottscheanum.*
5. Leaf cells unipapillate........ 6. *T. spurio-subtile.*
Leaf cells seriate-papillose........ 6.
6. Setæ 2 to 3 cm long........ 7.
Setæ under 2 cm long........ 8.
7. Leaves filiform-acuminate, denticulate........ 7. *T. alare.*
Leaves acuminate, sharply serrate........ 8. *T. Robinsonii.*
8. Leaves sharply serrate........ 9.
Leaves entire........ 11.
9. Leaves falcate-secund, finely acuminate, alar cells not inflated.
9. *T. Lindbergii.*
Leaves erect-spreading, broadly acuminate, alar cells inflated........ 10.
10. Dull plants, leaf cells strongly papillose........ 2. *T. instratum.*
Glossy plants, leaf cells faintly papillose........ 3. *T. batanense.*
11. Stems laxly pinnate, leaves to 1.6 mm long........ 10. *T. ramicola.*
Stems densely pinnate, leaves less than 1 mm long........ 12.
12. Leaves to 1 mm long, leaf cells 1: 18 or 1: 20........ 11. *T. Kerianum.*
Leaves to 0.5 mm long, leaf cells 1: 8 or 1: 10........ 12. *T. Bakeri.*

1. **TAXITHELIUM MERRILLII** Broth. Plate 26, fig. 442.

Taxithelium Merrillii BROTH., Philip. Journ. Sci § C 13 (1918) 219.

Rather robust, dull, brownish-green subaquatic plants in dense tufts. Stems creeping, closely pinnate, branches short, complanate-foliate, about 2 mm wide with leaves. Branch leaves erect-spreading, ovate, concave, obtuse or broadly acute, to 1.5 mm long and 0.5 mm wide; margins erect, minutely denticulate near apex; cells linear, 3 to 4 μ wide and 8 to 10 times as long, very minutely seriate-papillose, enlarged and slightly inflated in a small group at basal angles. Seta to 17 mm long, smooth, slightly curved at tip; capsules unknown.

PALAWAN, Taytay, *Merrill 8992.*

Endemic.

On roots of mangrove trees covered with salt or brackish water on extreme high tides.

2. TAXITHELIUM INSTRATUM (Brid.) Broth. Plate 26, fig. 443.

Taxithelium instratum (Brid.) BROTH., Rev. Bryol. (1901) 110.
Hypnum instratum BRID., Bryol. Univ. 2 (1827) 394.
Taxithelium petrophila WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 370.

Autoicous; slender, dull, yellowish-green plants in dense, flat mats. Stems elongate, creeping, rather regularly pinnate, branches widely spreading, less than 1 cm long, complanate-foliate. Branch leaves ovate from a contracted clasping base, concave, short-acuminate, to 1 mm long and 0.4 mm wide; margins erect, sharply serrate above and serrulate to base; cells narrowly rhomboidal, thin-walled, 4 μ wide and 10 to 20 times as long, strongly seriate-papillose, alar cells 2, oval, slightly inflated, often yellowish, supra-alar cells irregularly quadrate in a small group. Seta slender, 12 to 18 mm long, smooth, curved at tip; capsule small, horizontal, more or less gibbous; lid conical, apiculate, 0.4 mm long.

Numerous collections indicating a general distribution throughout the Archipelago.

Distribution: Siam, Malay Peninsula, Sumatra, Java, Borneo, Celebes, New Guinea.

On barks of trees and decayed wood. The most frequent species of the genus locally, and usually easily recognized by the short-pointed, strongly papillose leaves with 2 conspicuous and more or less inflated alar cells. *T. petrophila* Williams seems to be a stunted form with poorly developed alar cells, possibly due to the unusual habitat on a rock. It is so similar in all other particulars to *T. instratum* that I feel confident it is only an unusual form.

3. TAXITHELIUM BATANENSE Bartram sp. nov. Plate 26, fig. 444.

T. instrato simillimum, pallescens, nitidum. Caules complanate pinnati, ramis ad 15 mm longis, complanatis, 2.5 mm latis.

Folia anguste ovata, sensim acuminata, concava, ad 1.5 mm longa; cellulae angustissime lineares, minutissime papillosae.

Similar to *T. instratum* but slightly larger and with a decided lustre. Stems irregularly pinnate, branches strongly complanate-foliate, 2.5 mm wide with leaves. Leaves narrowly ovate from a constricted base, concave, to 1.5 mm long and about 0.4 mm wide, gradually acuminate; margins erect, serrulate all around; cells very long and narrow, vermicular, about 4 μ wide and 12 to 20 times as long, minutely seriate-papillose, alar cells few, subquadrate, slightly inflated at basal angles. Seta flexuose, 14 to 16 mm long; capsule small, inclined, gibbous on back; lid conical, short.

BATAN, Mount Iraya, *Bartlett 15464, 15471* (type), *15473, 15477.*

Endemic.

Distinguished from *T. instratum* by the longer, relatively narrower leaves, less strongly toothed margins, and uniformly narrower cells with very minute, scarcely visible papillæ.

4. TAXITHELIUM NEPALENSE (Schwaegr.) Broth. Plate 26, fig. 145.

Taxithelium nepalense (Schwaegr.) BROTH., Monsunia 1 (1900) 51.

Hypnum nepalense SCHWAEGR., Suppl. pt. 1 3 fasc. 2 (1830) *pl. 226.*

Autoicous; similar in habit and coloring to *T. instratum* but more robust, with densely foliate, more or less julaceous branches. Branch leaves broadly ovate, obtuse or bluntly acute, deeply concave, to 0.8 mm long and 0.5 mm wide; margins erect, minutely crenulate above; cells as in *T. instratum*, alar cells small, oval, not inflated, supra-alar cells irregularly quadrate, numerous, extending obliquely up margins. Seta 1 to 2 cm long, smooth; capsule inclined, strongly constricted under mouth when dry, urn 1 to 1.4 mm long.

LUZON, Rizal Province, Antipolo, *Ramos & Edaño 29578, 29579;* Kay Ungulan, *Bartlett 15321, 15324, 15331:* Zambales Province, Mount Labol, near Mount Katoh, *Ebalo 4;* Olongapo, *Ebalo 43, 48, 50, 53, 54, 59, 61, 73:* Bataan Province, Lamao River, *Bartlett 14652:* Laguna Province, Lake Bunot, *Bartlett 15217, 15218;* Paete, *Bartlett 15229.* PANAY, Capiz Province, Libacao, *Martelino & Edaño 35744* in part.

Distribution: India, Ceylon, Burma, Assam, Sumatra, Java, Borneo, Amboina.

Mostly on bark and dead wood. Closely resembling *T. instratum* but readily separated by the broader, more abruptly pointed, and more deeply concave leaves without any inflated cells at the basal angles.

5. **TAXITHELIUM GOTTSCHEANUM** (Hampe) Broth. Plate 26, fig. 446.

Taxithelium Gottscheanum (Hampe) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1091.
Hypnum Gottscheanum HAMPE, Linnæa 38 (1874) 563.
Taxithelium percapillipes BROTH., Philip. Journ. Sci. § C 8 (1913) 69.

Autoicous; relatively robust, pale yellowish-green, glossy plants in lax tufts. Stems creeping, irregularly pinnate, branches spreading, blunt, about 1 cm long, complanate-foliate. Leaves broadly ovate from a constricted base, abruptly acute, deeply concave, ecostate, 1 to 1.2 mm long, 0.7 mm wide; margins erect, sharply erose-denticulate above; cells about 3 µ wide, 12 to 15 times as long, minutely but very distinctly seriate-papillose, alar cells 2 or 3, small, oval, more or less inflated, pellucid or hyaline, with a small group of irregularly quadrate cells just above. Seta 1 to 2 cm long, very slender, smooth; capsule ovoid, suberect, wide-mouthed when dry, urn about 0.6 mm long; lid short, conical, apiculate.

LUZON, Tayabas Province, Mount Binuang, *Ramos & Edaño 28938*; Mount Pular, *Ramos 19481*: Camarines Sur Province, Botol River, *Edaño 84261* in part. POLILLO, *Robinson 6885* in part.

Distribution: Borneo.

On branches of trees. Probably allied to *T. nepalense* but thoroughly distinct in the larger, glossy, more sharply toothed leaves showing 2 or 3 distinctly inflated alar cells and the suberect capsules.

6. **TAXITHELIUM SPURIO-SUBTILE** Broth. Plate 26, fig. 447.

Taxithelium spurio-subtile BROTH., Philip. Journ. Sci. § C 5 (1910) 160.

Autoicous; very slender, delicate plants in dense, soft tufts, golden yellow, slightly glossy. Stems creeping, closely and irregularly pinnate, branches short, ascending, slightly complanate, about 0.5 mm wide with leaves. Leaves laxly erect-spreading, ovate from a strongly contracted base, long and slenderly acuminate, concave, up to 0.5 mm long and 0.25 mm wide; margins erect, serrulate nearly to base; cells linear-rhomboidal, thin-walled, 5 µ wide and about 10 times as long, conspicuously unipapillate over lumen on dorsal side, alar cells small, subquadrate, filiform-acuminate, minutely denticulate; seta 6 to 8 mm long; capsule slightly inclined, urn 1 mm long.

LUZON, Laguna Province, Mount Maquiling, *Bartlett 15708*. POLILLO, *McGregor 10509* (type), *Robinson 6885* in part.

Endemic.

On branches and twigs of trees. This species approaches *T. Kerianum* in the entire widely spreading leaves, but is, I think, quite distinct. The plants are much more laxly branched, the leaves are considerably larger, and the color is quite different.

11. TAXITHELIUM KERIANUM (Broth.) Fleischer. Plate 26, fig. 457.

Taxithelium Kerianum (Broth.) FLEISCH., Laubmfl. Java 4 (1919) 1343.

Trichosteleum Kerianum BROTH., Oefv. Finska Vet.-Soc. Foerh. (1890) 108.

Taxithelium horridulum BROTH., Philip. Journ. Sci. § C 8 (1913) 90.

Autoicous; small, dull, golden-yellow plants in dense feathery tufts. Stems elongate, creeping, densely pinnate, branches short, not spreading, laxly complanate-foliate, 1.5 mm wide with leaves. Leaves horizontally spreading, ovate-lanceolate, slenderly acuminate, entire, concave, to 1 mm long and about 0.3 mm wide; cells narrowly linear, 3 μ wide and 16 to 18 times as long, distinctly seriate-papillose, alar cells few and small, occasionally slightly enlarged at extreme angles. Perichætial leaves filiform-acuminate, subentire; seta about 5 mm long, very slightly rugulose toward tip; capsule minute, suberect.

LUZON, Laguna Province, Mount Banahao, *Robinson 9773*. MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15933*.

Distribution: Australia, Java, New Guinea.

On dead wood. As these collections agree perfectly with *T. Kerianum* in every particular there is no doubt that *T. horridulum* Broth. must be relegated to synonymy.

12. TAXITHELIUM BAKERI Broth. Plate 24, fig. 441.

Taxithelium Bakeri BROTH., Philip. Journ. Sci. § C 13 (1918) 218.

Autoicous; similar to *T. Kerianum* but smaller and less densely branched, branches 1 mm wide with leaves. Leaves complanate, ovate-lanceolate, acuminate, entire or nearly so, to 0.5 mm long and 0.2 mm wide; cells about 4 μ wide and 8 to 10 times as long, distinctly seriate-papillose, marginal row frequently shorter, rhomboidal and smooth, alar cells few and small, not at all inflated. Perichætial leaves filiform-acuminate, minutely crenulate; seta 4 to 5 mm long, reddish, not quite smooth at tip; capsule minute, pendulous.

LUZON, Laguna Porvince, Los Baños, *Baker 2379*, *2400*.

Endemic.

On bark of trees. These collections indicate a smaller plant than *T. Kerianum*, with shorter leaves and shorter cells. These distinctions are slight, and I am by no means sure that *T. Bakeri* will prove to be a distinct species when further collections are available for comparison.

159. Genus GLOSSADELPHUS Fleisch.

Glossadelphus FLEISCH., Laubmfl. Java 4 (1920) 1351.

Slender or medium-sized plants in flat mats, mostly growing on damp rocks. Stems creeping, irregularly pinnate, branches usually complanate-foliate. Leaves lingulate or ovate, obtuse or bluntly pointed, toothed toward apex, lateral rows often more or less asymmetrical; costa short and double, rarely wanting; cells linear, often papillose at apical angles. Seta elongate, smooth; capsule ovoid, inclined, gibbous on back; peristome as in *Taxithelium*; lid conical, apiculate.

Key to the species of Glossadelphus.

Leaves lingulate, obtuse .... 1. *G. micro-similans*.
Leaves ovate, acuminate .... 2. *G. Zollingeri*.

1. GLOSSADELPHUS MICRO-SIMILANS (Dix.) Bartram comb. nov. Plate 16, fig. 154.

Taxithelium micro-similans DIX., Linn. Soc. Journ. Bot. + No. 333 (1935) 131.

Probably dioicous; slender, yellowish, glossy plants in flat mats. Stems elongate, irregularly pinnate, branches blunt, complanate-foliate, 1 to 1.5 mm wide with leaves. Leaves ovate-lingulate, obtuse or bluntly acute, concave, to 0.8 mm long and about 0.3 mm wide; margins erect, strongly serrate in upper third and denticulate to base; costa double, with unequal forks extending about ¼ up the leaf; cells linear, 3 μ wide and about 15 times as long, minutely papillose at apical angles, minute, rounded, and opaque in a small group at basal angles.

LUZON, Zambales Province, Mount Marayep, *Ramos & Edaño 44815a*.

Distribution: Borneo.

This collection is scanty and in none too good condition, but the plants are exactly similar to those from Mount Kinabalu in British North Borneo.

7. **GLOSSADELPHUS ZOLLINGERI** (C. M.) Fleisch. Plate 26, fig. 451.

Glossadelphus Zollingeri (C. M.) FLEISCH., Laubmfl. Java 4 (1920) 1355.

Hypnum Zollingeri C. M., Syn. 2 (1851) 241.

Ectropothecium rizalense BROTH., Philip. Journ. Sci. § C 3 (1908) 26.

Dioicous; slender plants in flat mats, yellowish or sordid green, glossy. Stems elongate, pinnate, branches widely spreading, about 1 cm long, cuspidate at tips, rather laxly complanate-foliate. Leaves curved, more or less homomallous, ovate, concave, short-acuminate, to 1 mm long and 0.5 mm wide; margins erect, minutely denticulate; costa double, extending about ¼ up the leaf, rarely wanting; cells linear, thin-walled, 3 to 4 μ wide and 10 to 12 times as long, smooth or minutely papillose at apical angles, not or scarcely differentiated at basal angles. Sporophyte not seen.

LUZON, Rizal Province, *Foxworthy 70*. PALAWAN, Mount Mantalingahan, *Edaño 80851*.

Distribution: Java, Celebes, Fiji, Hawaii.

On wet rocks. A variable plant with a distinctly subaquatic habit, partial to sloping wet rock faces.

160. MACROHYMENIUM C. M.

Macrohymenium C. M., Bot. Zeit. (1847) 825.

Medium-sized, yellowish-green, glossy plants. Stems creeping, irregularly branched. Leaves ovate-lanceolate, concave, acuminate, entire; costa short and double or none; cells oval-rhomboidal, smooth, rounded-quadrate and colored at basal angles. Seta short, more or less rugulose; capsule erect, ovoid-cylindric; peristome double, teeth short and striolate, segments of endostome from a low basal membrane, 2 to 3 times as long as teeth; lid conic-rostrate, long-beaked.

MACROHYMENIUM STRICTUM Bryol. Jav. Plate 26, fig. 454.

Macrohymenium strictum Bryol. Jav., Bryol. Jav. 2 (1865) 114.

Autoicous; plants in lax low tufts. Stems creeping, densely radiculose, branches short, ascending, densely foliate, obtuse. Leaves laxly appressed when dry, spreading when moist, ovate-lanceolate, abruptly acuminate, concave, entire, ecostate, 1.5 mm long, 0.5 mm wide, margin more or less reflexed on one side; cells oval-rhomboidal, with firm walls, opaque, 6 to 10 μ wide and 25 to 35 μ long, slightly more elongate near base and yellow across insertion, larger, oval and subquadrate at basal angles in a well-marked yellowish pellucid group. Inner perichaetial leaves 2 mm long, acuminate, subentire; seta stout, reddish, 7 to 8 mm long, weakly pustulose toward apex; capsule erect, narrowly ovoid-cylindric, urn 1.5 mm long; peristome teeth short, densely striolate, segments of endostome about 0.7 mm long, more than twice as long as teeth, carinate and perforate along median line, from a low basal membrane, orange-brown below; spores papillose, 18 to 20 µ.

MINDANAO, Davao Province, Todaya, Mount Apo, *Williams 2675.*

Distribution: Borneo.

On trees. The Mindanao collection is richly fruited and shows the curious peristome structure to good advantage.

41. Family HYPNACEÆ

Small or moderately robust, usually glossy plants growing in intricate mats. Stems creeping, often pinnate or subpinnately branched. Leaves ovate or ovate-lanceolate, acuminate, often more or less falcate-secund; costa short and double or none; cells mostly linear, prosenchymatous, smooth or slightly papillose, alar cells small and poorly differentiated. Seta elongate, slender, smooth; capsule ovoid, more or less asymmetrical, usually horizontal or pendulous; peristome usually double, teeth striolate, segments of endostome keeled, from a high basal membrane, usually with intermediate cilia; lid short, apiculate; calyptra cucullate.

Key to the genera of Hypnaceæ.

1. Capsule erect, endostome wanting............ 161. *Stereodontopsis.*
   Capsule horizontal or pendulous............ 2.
2. Leaf cells relatively short, oval or rhomboidal............ 3.
   Leaf cells narrowly linear............ 4.
3. Leaf cells parenchymatous, sharply papillose......... 164. *Ectropotheciella.*
   Leaf cells prosenchymatous, smooth............ 167. *Vesicularia.*
4. Stem and branch leaves differentiated, strongly toothed all around. 168. *Ctenidium.*
   Stem and branch leaves similar, seldom toothed to base............ 5.
5. Leaves symmetrical, mostly falcate............ 6.
   Leaves asymmetrical, usually complanate............ 7.
6. Capsule and lid strongly mamillose............ 163. *Trachythecium.*
   Capsule and lid smooth............ 162. *Ectropothecium.*
7. Plants whitish, very lustrous, perichætial leaves incised. 167. *Vesicularia.*
   Plants green, not or slightly glossy, perichætial leaves not incised....... 8.
8. Leaves subentire, cells smooth............ 165. *Isopterygium.*
   Leaves toothed nearly to base, cells more or less papillose at apical angles. 166. *Taxiphyllum.*

161. Genus STEREODONTOPSIS Williams

Stereodontopsis WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 368.

Moderately robust plants in lax mats. Stems ascending, irregularly pinnate, often with numerous short, curved microphyllous branchlets. Leaves falcate-secund, ovate-lanceolate, plicate, ecostate; cells linear, irregularly rounded in a small group at basal angles. Seta distinctly scabrous above; capsule erect; peristome single, teeth narrow and papillose, endostome none.

STEREODONTOPSIS FLAGELLIFERA Williams. Plate 16, fig. 157.

Stereodontopsis flagellifera WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 368.

Dioicous; rather robust, lustrous plants, golden-green tinged with brown, in lax tufts or mats. Stems ascending, flexuose, sparingly radiculose, irregularly pinnate and bipinnate, branches short, blunt, often with numerous short, curved, microphyllous flagella. Leaves crowded, falcate-secund, narrowly ovate-lanceolate, gradually acuminate, plicate, about 2 mm long and 0.5 mm wide at base; margins narrowly recurved, minutely denticulate toward apex; cells linear, smooth, 4 µ wide and 12 to 16 times as long, colored across insertion, irregularly rounded, incrassate and golden-brown at basal angles in a small distinct group. Inner perichætial leaves erect, not plicate, gradually acuminate, entire or serrulate above; seta about 15 mm long, scabrous above; capsule erect, cylindric, urn about 2 mm long; peristome teeth distant, narrow, finely papillose; calyptra (immature) long-pilose; spores 8 to 10 µ. Sporophyte not seen.

LUZON, Cagayan Province, Kilingkiling, *Edaño 79744*. MINDANAO, Sax River, *Williams 2387* (type).

Endemic.

On tree trunks and logs in forested slopes. This unique endemic species should be readily recognized by the conspicuous flagelliform branchlets and the plicate leaves. The sporophyte characters in the description are transcribed from the original publication.

162. Genus ECTROPOTHECIUM Mitt.

Ectropothecium MITT., Journ. Linn. Soc. 12 (1869) 22 in part.

Slender or robust glossy plants in extensive thin mats. Stems elongate, creeping, more or less regularly pinnate. Leaves symmetrical, usually falcate-secund, ovate-lanceolate, acuminate; costa none or short and double; cells linear, small and poorly differentiated at basal angles. Seta smooth, elongate; capsule horizontal or pendulous, short, ovoid, strongly constricted under mouth when dry; peristome double, normal; lid conical, apiculate; calyptra cucullate.

A large genus with many taxonomic difficulties, abundantly represented in the Philippines.

Key to the species of Ectropothecium.

1. Dioicous, perichætial leaves more or less plicate .... 2.
   Autoicous or heteroicous, perichætial leaves not plicate .... 6.
2. Slender plants, setæ less than 2 cm long .... 3.
   Robust plants, setæ over 2 cm long .... 4.
3. Branch leaves strongly falcate, mostly over 0.75 mm long.
   1. *E. ichnotocladum.*
   Branch leaves complanate, widely spreading, under 0.5 mm long.
   2. *E. perminutum.*
4. Branch leaves minutely toothed .... 3. *E. falciforme.*
   Branch leaves sharply serrate .... 5.
5. Leaves finely acuminate, stems irregularly branched .... 4. *E. luzoniae.*
   Leaves broadly acuminate, stems regularly pinnate .... 5. *E. buitenzorgii.*
6. Stems closely and regularly pinnate, leaves strongly falcate .... 7.
   Stems irregularly branched, more or less complanate-foliate .... 9.
7. Leaf cells 6 : 1 or 10 : 1 .... 6. *E. ferrugineum.*
   Leaf cells 15 : 1 or 20 : 1 .... 8.
8. Plants soft, branches equal, forming a long, narrow frond.
   7. *E. eleganti-pinnatum.*
   Plants stiff, fronds more or less irregular .... 8. *E. striatulum.*
9. Setæ 12 to 15 mm long .... 9. *E. dealbatum.*
   Setæ 6 to 8 mm long .... 10. *E. monumentorum.*

1. ECTROPOTHECIUM ICHNOTOCLADUM (C. M.) Jaeg. Plate 27, fig. 153.

Ectropothecium ichnotocladum (C. M.) JAEG., Adumbr. 2 (1877–1878) 593.

Hypnum ichnotocladum C. M., Syn. 2 (1851) 301.

? *Hypnum callichroides* C. M., Linnæa 38 (1874) 562.

Dioicous; slender, yellowish plants in extensive mats, slightly glossy. Stems to 4 cm long, closely, more or less irregularly pinnate, branches hooked at tips. Leaves crowded, strongly falcate, narrowly ovate-lanceolate, acuminate, concave, to 1.4 mm long and 0.3 mm wide, serrulate in upper half; cells linear, smooth, marginal row slightly wider and rhomboidal toward apex, not or scarcely differentiated at basal angles. Perichætium large, seta to 1.5 cm long; capsule turgid, ovoid, horizontal or pendulous.

LUZON, Rizal Province, Montalban, *Bartlett 14512*; Benguet Subprovince, Mount Santo Tomas, *Bartlett 13297*; Baguio, *Bartlett 13370*; Luisb to Kabayan, *McGregor 8788*; Sablan, *Williams 1702*; Laguna Province, Mount Maquiling, *Robinson 17101*, *Bart-*

lett, numerous collections, *No. 15713* to *15799* inclusive; Nueva Ecija Province, Camp Martyr, *Santos 196*; Tayabas Province, Baler, *Santos 200*, *369*; Zambales Province, Mount Marayep, *Ramos & Edaño 44819a*. BOHOL, *Ramos 43425*. MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15886*, *15918*; Davao Province, Sibuyan River, *Copeland 970*.

Distribution: Sumatra, Java, Borneo, Celebes, Amboina, Annam.

On living and dead trees. A slender attractive little plant with the leaf tips usually neatly and regularly recurved. The variations in size, the length of the acumen, and the degree of serration seem to be only relative. I have had no success in segregating the forms with more shortly pointed subentire leaves, and believe that *H. callichroides* C. M. may be safely included here.

1. **ECTROPOTHECIUM PERMINUTUM** Broth. Plate 27, fig. 459.

Ectropothecium perminutum Broth. in herb.

Dioicum. *E. haplocladо* Card. affine. Differt foliis magis dimorphis, longius acuminatis, cellulis sublaevibus.

Dioicous; very slender, delicate plants, yellowish green, slightly glossy, in thin mats. Stems to 3 cm long, laxly and irregularly pinnate, branches complanate-foliate, scarcely 1 mm wide with leaves. Leaves clearly dimorphous, stem leaves ovate-lanceolate, long and finely acuminate, to 0.7 mm long and 0.3 mm wide, sharply serrulate nearly to base; branch leaves smaller with shorter, broader points; cells 3 to 4 μ wide and 6 to 10 times as long, smooth or minutely papillose at apical angles, alar cells not differentiated. Perichaetial leaves long-acuminate, minutely denticulate above; seta slender, 7 to 10 mm long, curved at tip; capsule minute, horizontal, urn 0.5 mm long.

LUZON, Laguna Province, Mount Banahao, *Baker 3558*, *6861*; Mount Maquiling, *Robinson 17012*, *17020*, *17032* (type), *Baker 2888*, *Bartlett 15809*, *15810*. MINDORO, Puerto Galera, *Bartlett 13829*, a distinct form regularly pinnate with numerous short uniform branches.

Endemic.

The slenderer habit and flattened branches with the leaves widely spreading and inconspicuously falcate will help to separate this species from *E. ichnotocladum*. It is probably nearest *E. haplocladum* Card. of Java, but seems to be well distinguished from this species by the more finely acuminate stem leaves and smoother leaf cells.

3. **ECTROPOTHECIUM FALCIFORME** (Doz. and Molk.) Jaeg. Plate 27, fig. 460.

Ectropothecium falciforme (Doz. and Molk.) JAEG., Adumbr. 2 (1877–1878) 522.

Hypnum falciforme Doz. and Molk., Ann. Sci. Nat. 4 (1844) 306.

Ectropothecium Elmeri BROTH., Leafl. Philip. Bot. 6 (1913) 1976.

Dioicous; robust, golden-green, glossy plants in extensive intricate mats. Stems closely and more or less regularly pinnate, to 10 cm long or longer. Branch leaves falcate, ovate-lanceolate, short-acuminate, minutely denticulate toward apex, about 1 mm long and 0.4 mm wide; costa short and double, at times extending ¼ up the leaf; cells narrowly linear, smooth, laxer and irregularly rounded in a small group at basal angles. Stem leaves slightly larger. Seta 3 to 4 cm long, curved at tip; capsule large, pendulous, ovoid, urn 1.5 mm long.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 19923, 19924*. PANAY, Antique Province, *McGregor 32640, 32641, 32645, 32655*. NEGROS, Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 10004*.

Distribution: Sumatra, Java, Lombok, Borneo, Celebes.

Distinguished from *E. buitenzorgii* by the shorter, broader leaf points very minutely toothed toward apex.

4. **ECTROPOTHECIUM LUZONIAE** (C. M.) Jaeg. Plate 27, fig. 461.

Ectropothecium luzoniae (C. M.) JAEG., Adumbr. 2 (1877–1878) 524.

Hypnum luzoniae C. M., Linnaea 38 (1874) 563.

Dioicous; moderately robust, golden-yellow, glossy plants in lax tufts or mats. Stems elongate, usually irregularly pinnate. Branch leaves more or less falcate, ovate-lanceolate, long and slenderly acuminate, sharply serrate in upper half and serrulate nearly to base, to 1.3 mm long and 0.4 mm wide; cells narrowly linear, scarcely differentiated at basal angles. Stem leaves slightly larger. Seta 2 to 3 cm long; capsule large, ovoid, pendulous, urn 1.5 to 2 mm long; lid 0.7 mm long, short-beaked from a convex base.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Williams 1748*; Baguio, *Robinson 14016, 14017*; Ifugao Subprovince, Mount Polis, *McGregor 20308*; Bontoc Subprovince, Mount Pukis, *Ramos & Edaño 38266*; Tayabas Province, Mount Binuang, *Ramos & Edaño 28937* in part. MINDORO, Puerto Galera, *Bartlett 13630, 13376*.

Endemic.

As I understand this plant it is ordinarily slenderer and more laxly and irregularly branched than *E. buitenzorgii*, but I doubt whether it is more than a form of that species. The strongly serrate leaf margins will separate it from *E. falciforme* to which it often bears a superficial resemblance.

3. ECTROPOTHECIUM BUITENZORGII (Bel.) Jaeg. Plate 27, fig. 482.

Ectropothecium buitenzorgii (Bel.) JAEG., Adumbr. 2 (1877–1878) 524.
Hypnum Buitenzorgii BEL., Voy. Ind. Or. Bot. 2 Crypt. (1835) 94.
Ectropothecium subintorquatum BROTH., Philip. Journ. Sci. § C 3 (1908) 27.
Ectropothecium brachyphyllum BROTH., Philip. Journ. Sci. § C 13 (1918) 216.

Dioicous; robust golden-green or brownish glossy plants in extensive mats. Stems elongate, rather rigid, closely and regularly pinnate, branches widely spreading, slightly flattened, blunt and hooked at tips. Branch leaves falcate, often lightly plicate, ovate-lanceolate, more or less slenderly acuminate, to 1.6 mm long; margins sharply serrate in upper half and serrulate nearly to base; costa none or very short and double; cells linear or linear-rhomboidal, 5 to 7 μ wide, subquadrate at basal angles in a small, poorly defined group. Stem leaves slightly larger and occasionally with a larger group of hyaline alar cells. Perichætial leaves gradually acuminate, sharply serrate; seta 2.5 to 3.5 cm long, red; capsule pendulous, turgid, ovoid; lid convex with a short beak.

Numerous collections indicate a wide distribution throughout the Archipelago.

Distribution: Sumatra, Java, Amboina, Ceram, Celebes, Borneo.

On earth and trees. This appears to be a very plastic species but usually well characterized by the stiff wiry stems, closely and regularly pinnate, the long setæ, and the sharply toothed leaves. Some of the forms are quite slender, others have the branches more or less complanate-foliate, but I fail to find any coördinating characters in the variations. *E. subintorquatum* seems almost surely to belong here.

4. ECTROPOTHECIUM FERRUGINEUM (C. M.) Jaeg. Plate 27, fig. 483.

Ectropothecium ferrugineum (C. M.) JAEG., Adumbr. 2 (1877–1878) 526.
Hypnum ferrugineum C. M., Linnaea 38 (1874) 561.

Heteroicous; moderately robust plants, but slenderer than *E. buitenzorgii*; usually with a brownish cast, slightly glossy, in dense mats. Stems to 6 cm long or longer, regularly pinnate, forming a narrow frond, branches widely spreading, hooked at tips. Branch leaves crowded, ovate-lanceolate, gradually acuminate, to 1.5 mm long, sharply serrate in upper half; cells linear-rhomboidal, 5 µ wide and 6 to 10 times as long, slightly papillose at apical angles, marginal row shorter, rhomboidal and usually well differentiated, alar cells few and irregular with a single large hyaline cell at basal angles. Seta red, hooked at tip, 1.5 to 2 cm long, capsule small, ovoid, pendulous, urn 1 mm long.

LUZON, boundary of Nueva Ecija and Tayabas Provinces, *Santos 215:* Laguna Province, Mount Maquiling, *Robinson 17011, 17017, 17030, 17046, 17049, 17058.* MINDORO, Puerto Galera, *Bartlett 13950.* PANAY, Capiz Province, Mount Bulilao, *Martelino & Edaño 35795, 35797.*

Endemic.

On dead wood and rocks. Distinguished from the slender forms of *E. buitenzorgii* by the inflorescence and the shorter setæ. A more pertinent question is its relation to *E. Moritzii* (C. M.). The leaf cells average shorter than in this species and are often sharply papillose, and the setæ are slightly longer, but these distinctions are all relative, and I imagine *E. ferrugineum* will eventually have to be united with *E. Moritzii.*

7. ECTROPOTHECIUM ELEGANTI-PINNATUM (C. M.) Jaeg. Plate 27, fig. 464.

Ectropothecium eleganti-pinnatum (C. M.) JAEG., Adumbr. 2 (1877–1878) 564.

Hypnum eleganti-pinnatum C. M., Linnæa 38 (1874) 664.

Autoicous; slenderer than *E. ferrugineum* and yellowish green. Stems elongate, closely and regularly pinnate in a long narrow frond. Branch leaves scarcely 1 mm long, smaller than stem leaves, slenderly acuminate, deeply concave, sharply serrulate in upper half; cells narrowly linear, 3 µ wide and 15 to 20 times as long, smooth, alar cells few and minute, often with a single large hyaline cell at basal angles. Seta slender, about 1 cm long; capsule horizontal, small, turgid, ovoid.

LUZON, Tayabas Province, Infanta, *Robinson 9495;* Baler, *Santos 340a:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15840.* PALAWAN, Cabinbin River, *Weber 1564.*

Endemic.

When typically developed the long, narrow, soft fronds are characteristic. The leaf cells are longer than in *E. ferrugineum* and not differentiated at the margins.

8. **ECTROPOTHECIUM STRIATULUM** Dix. Plate 27, fig. 445.

Ectropothecium striatulum Dix. in herb.

Autoicum. Sat robustum, fusco-viride, late extensum. Caulis elongatus, repens, pinnatum et complanata ramosus. Folia caulina circa 1.5 mm longa, complanata, leniter falcata, sicca striatula, e basi latiore sensim in acumen elongatum arcte serratum attenuata; costa bina, brevis; cellulae anguste lineares, alares paucissime, minutae. Folia ramea breviora, falcata. Folia perichaetialia longissime acuminata, serrata; seta 12 ad 15 mm longa; theca parva, pendula.

Autoicous; rather robust plants, brownish green, slightly glossy, in extensive mats. Stems creeping, up to 5 cm long or longer, densely pinnate, branches complanate, short, forming a narrow, more or less irregular frond. Branch leaves complanate, lightly falcate, more or less striate when dry, up to 1.5 mm long, ovate-lanceolate, gradually long and finely acuminate from a broad base, sharply serrate above; costa short and double; cells linear, about 15:1, alar cells few and minute. Branch leaves smaller, more strongly falcate, concave. Perichaetial leaves narrowed to a long sharply serrate acumen; seta slender, red, 12 to 15 mm long; capsule small, pendulous.

PALAWAN, Mount Mantalingahan, *Edaño 80849*.

Distribution: Malay Peninsula, Sumatra.

This species is probably allied to *E. eleganti-pinnatum* but appears to be distinct in the more rigid, wiry stems less regularly pinnate, and in the faintly striate stem leaves.

9. **ECTROPOTHECIUM DEALBATUM** (Hornsch. and Reinw.) Jaeg. Plate 27, fig. 446.

Ectropothecium dealbatum (Hornsch. & Reinw.) JAEG., Adumbr. 2 (1877–1878) 528.

Hypnum dealbatum HORNSCH. & REINW., Nov. Act. Acad. Caes. Leop. Carol. 14 Suppl. 2 (1828) 729.

Ectropothecium assimile BROTH., Philip. Journ. Sci. § C 5 (1910) 158.

Autoicous; small plants resembling *E. monumentorum* but slightly more robust. Branches complanate-foliate. Leaves slightly falcate, to 1.4 mm long, ovate-lanceolate, acuminate, serrulate toward apex, cells 12:1 or 15:1, marginal row slightly differentiated. Seta slender, red, 12 to 16 mm long; capsule horizontal or pendulous, ovoid, urn 0.8 mm long; lid convex, sharply beaked.

LUZON, Cagayan Province, Angapan River, *Edaño 79743*; Sitio Rabayuan, *Bartlett 14925*; Rizal Province, Montalban, *Robinson*

9654, Bartlett 14521: Benguet Subprovince, Sablang, *Fenix 12797:* Laguna Province, Mount Maquiling, *Merrill 6316, Bartlett 15707.* PANAY, Iloilo Province, *Robinson 18092, 18128, 18143.* MINDANAO, Agusan Province, *Weber 1510, 1501, 1507:* Lanao Province, Pugaan Hill, *Bartlett 15930.* LUMBUCAN, *Merrill 7194.* JOLO, Bud Kaunayan, *Bartlett 16087, 16089, 16090, 16092, 16099, 16101, 16104, 16105, 16108, 16109, 16113, 16114.*

Distribution: Sumatra, Java, Borneo.

Mostly on the barks of trees. The most noticeable difference between this species and *E. monumentorum* is in the length of the setæ. The leaves are apt to be more curved and more slenderly acuminate, but the differences are very slight. I can find no character of any value separating *E. assimile* Broth. from *E. dealbatum.*

14. ECTROPOTHECIUM MONUMENTORUM (Duby) Jaeg. Plate 37, fig. 465.

Ectropothecium monumentorum (Duby) JAEG., Adumbr. 2 (1877-1878) 523.

Hypnum monumentorum DUBY in Moritzi Verz. (1846) 132.

Autoicous; small, delicate plants in thin mats, yellowish green, slightly glossy. Stems elongate, rather closely pinnate, branches short, widely spreading in a narrow irregular frond. Branch leaves more or less complanate, slightly falcate, about 1 mm long, ovate-lanceolate, gradually acuminate, minutely serrulate above middle; cells very long and narrow, 15:1 or 20:1, marginal row slightly wider, not differentiated at basal angles. Seta short, slender, up to 8 mm long; capsule small, pendulous, ovoid; lid convex, apiculate.

DALUPIRI, *Bartlett 15171.* BATAN, Mount Iraya, *Bartlett 15466.* LUZON, Cagayan Province, Magapit, *Bartlett 14872:* Rizal Province, Kay Ungulan, *Bartlett 15314, 15327:* Bulacan Province, Kay Tianak, *Bartlett 14700, 14701, 14722, 14747:* Bataan Province, Lamao River, *Williams 860:* Cavite Province, Silang and Balcto, *Bartlett 14785, 14808:* Laguna Province, Mount Maquiling, *Bartlett 15612 to 15790,* numerous collections. PANAY, Iloilo Province, *Robinson 18048, 18054, 18090, 18108, 18218:* Capiz Province, Libacao, *Martelino & Edaño 35783.* LUMBUCAN, Sulu Sea, *Merrill 7197.* JOLO, Bud Sungal, *Bartlett 16068;* Bud Kaunayan, *Bartlett 16118.*

Distribution: Sumatra, Java, Caroline Islands, Timor.

On rocks and logs. In gross appearance some of the forms of this species approach *E. cyperoides* (Hook.) but may be separated by the autoicous inflorescence and the more complanate foliation, with the leaves delicate in texture and green due to the chlorophyllose content of the cells.

163. Genus TRACHYTHECIUM Fleisch.

Trachythecium FLEISCH., Laubmfl. Java 4 (1922) 1415.

Slender plants in dense, intricate mats, differing from *Ectropothecium* chiefly in the mamillose capsule and lid.

Key to the species of Trachythecium.

Branch leaves straight, mostly entire	1. *T. verrucosum.*
Branch leaves falcate, serrulate	2. *T. micropyxis.*

1. TRACHYTHECIUM VERRUCOSUM (Hampe) Fleisch. Plate 27, fig. 465.

Trachythecium verrucosum (Hampe) FLEISCH., Laubmfl. Java 4 (1922) 1416.

Hypnum verrucosum HAMPE, Ic. Musc. (1844) pl. 10.

Autoicous; slender, delicate, yellowish-green plants, slightly glossy, in dense, soft, feathery mats. Stems creeping, irregularly pinnate. Leaves rather crowded, erect-spreading on all sides, ovate-lanceolate, concave, ecostate, gradually, or often abruptly, narrowed to a long, finely acuminate point, entire or nearly so, up to 0.8 mm long and 0.25 mm wide; cells 3 to 5 µ wide and 8 to 12 times as long, smooth or minutely papillose at apical angles, alar cells not differentiated. Perichaetial leaves filiform-acuminate, entire; seta 6 to 13 mm long; capsule small, pendulous, urn to 1 mm long, coarsely mamillose; lid convex, with a short conical beak, mamillose.

LUZON, Benguet Subprovince, Lutab to Kabayan, *McGregor 8789*; Baguio, *Williams 1747*: Laguna Province, Mount Maquiling, *Robinson 9673, 17042, Bartlett 15773*: La Union Province, Banang, *Fenix 12989*. MINDORO, Puerto Galera, *Bartlett 13683, 13679* in part, *13761* in part. NEGROS, Canlaon Volcano, *Merrill 6825*. PANAY, Iloilo Province, *Robinson 18056, 18087, 18159, 18225*: Capiz Province, Mount Bulilao, *Martelino & Edaño 35807*. MINDANAO, Sax River, *Williams 2391*: Lanao Province, Pugaan Hill, *Bartlett 15938*. JOLO, Bud Sungal, *Bartlett 16061, 16065, 16070a*.

Distribution: Sumatra, Java, Borneo, Amboina, New Guinea, New Caledonia.

On earth, logs, and stones. Although variable in size and leaf outline this species is well characterized by the nearly straight, slenderly pointed leaves spreading in all directions. In habit and coloring it is reminiscent of some of the slender forms of *Campylium*.

2. TRACHYTHECIUM MICROPYXIS (Broth.) Bartram comb. nov. Plate 27, fig. 461.

Ectropothecium micropyxis BROTH., Philip. Journ. Sci. § C 5 (1910) 152.

Autoicous; slender, glossy, yellowish-green plants in dense, soft tufts. Stems to 4 cm long, densely pinnate, branches slightly hooked at tips. Stem leaves ovate-lanceolate, filiform-acuminate, entire, to 1.3 mm long and 0.4 mm wide; costa short, double; cells 3 to 4 μ wide and 8 to 12 times as long, smooth, in a very small group, short and irregular at basal angles. Branch leaves smaller, more or less falcate, serrulate toward apex. Perichætial leaves long filiform-acuminate, entire; seta 7 to 10 mm long; capsule small, pendulous, urn 0.6 mm long, mamillose; lid mamillose, convex, short-beaked.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 19921*, a form with setæ up to 2 cm long; Laguna Province, Mount Maquiling, *Merrill 6318*, *Baker 2611*. PALAWAN, summit of Mount Gantung, *Edaño 80894*. MINDANAO, Agusan Province, *Weber 1499*; Lanao Province, Palao Amopo, *Bartlett 15977*, *15978*, *16021*.

Endemic.

Distinguished from *T. verrucosum* by the branch leaves falcate and serrulate above.

164. Genus ECTROPOTHECIELLA Fleisch.

Ectropotheciella FLEISCH., Nova Guinea Bot. (2) 12 (1914) 123.

Slender plants in thin, intricate mats. Stems creeping, pinnately branched, branches complanate-foliate. Leaves widely spreading, ovate-lanceolate, concave; costa double and short; cells parenchymatous, short-rhomboidal, sharply papillose at apical angles. Perichætial leaves long-ciliate; seta slender, smooth; capsule ovoid, erect; peristome single, endostome wanting.

ECTROPOTHECIELLA DISTICHOPHYLLA (Hampe) Fleisch. Plate 27, fig. 470.

Ectropotheciella distichophylla (Hampe) FLEISCH., Nova Guinea (2) 12 Bot. (1914) 123.

Hypnum distichophyllum HAMPE, Bryol. Jav. 2 (1866) 167.

Glossadelphus bakeri BROTH., Philip. Journ. Sci. 31 (1926) 298.

Dioicous; slender, dull yellowish-green plants in lax depressed mats. Stems creeping, to 5 cm long, densely pinnate, branches to 6 mm long, laxly complanate-foliate, 1.5 mm wide with leaves. Branch leaves in bilateral rows, widely spreading, ovate-lanceolate, concave, gradually acuminate, about 0.8 mm long; margins erect, denticulate all around; cells rhomboidal, 5 to 6 μ wide and 3 to 4 times as long, sharply papillose at apical angles. Stem leaves similar but slightly smaller. Sporophyte not seen.

LUZON, Cagayan Province, Abulug River, *Weber 1590*; Rizal Province, Montalban, *Bartlett 14495, 14526*; Hinulugan Taktak (waterfall), *Bartlett 15253*; Laguna Province, Mount Maquiling, *Baker 2400, 2588, 7008, Williams 2076a* in part, *Bartlett 15803a*. MINDORO, Puerto Galera, *Bartlett 13647, 13903*. MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15877, 15883, 15888, 15929, 15937*.

Distribution: Siam, Java, Celebes, Amboina.

On trees. A neat, slender little plant with the habit of *Taxithelium* but quickly separable under the microscope by the short-rhomboidal cells being sharply papillose at the ends.

165. Genus ISOPTERYGIUM Mitt.

Isopterygium MITT., Journ. Linn. Soc. 12 (1869) 21.

Mostly slender, glossy plants growing in flat mats. Stems creeping, irregularly branched, branches usually complanate-foliate. Leaves ovate-lanceolate, often asymmetrical, entire or minutely toothed above; costa double and short or none; cells linear, rarely papillose at apical angles, alar group poorly differentiated. Seta smooth, elongate; capsule small, nodding; peristome double, usually perfect; lid conical.

Key to the species of Isopterygium.

1. Dioicous .... 2.
   Autoicous .... 3.
2. Robust plants, leaves over 1.5 mm long .... 1. *I. Textori.*
   Slender plants, leaves 1 mm or less long .... 6. *I. saxense.*
3. Branch leaves narrow, nearly symmetrical .... 2. *I. minutirameum.*
   Branch leaves broader, asymmetrical .... 4.
4. Leaves ovate, very short-acuminate .... 3. *I. pendulum.*
   Leaves ovate-lanceolate, long-acuminate .... 5.
5. Plants whitish or silvery green, branch leaves subentire.
   4. *I. albescens.*
   Plants yellowish green, branch leaves serrulate .... 5. *I. bancanum.*

1. **ISOPTERYGIUM TEXTORI** (Lac.) Mitt. Plate 33, fig. 471.

Isopterygium Textori (Lac.) MITT., Trans. Linn. Soc. London (Bot.) pt. 3 3 (1891) 176.

Rhynchostegium Textori LAC., in Miq. Ann. Mus. Bot. Lugd. Bat. 2: 299.

Dioicous; robust, glossy plants in dense mats, pale green at tips, darker below. Stems prostrate, irregularly branched, radiculose in tufts, branches 3 to 3.5 mm wide with leaves, complanate-foliate. Leaves ovate, concave, short-acuminate, asymmetrical, widely spreading, to 1.9 mm long and 0.8 mm wide; margins erect, denticulate toward apex; costa short, double, forks unequal; cells linear-rhomboidal, about 5 µ wide and 6 to 10 times as long, thin-walled, slightly obscure due to conspicuous cytoplasm, shorter and laxer at extreme base, without a differentiated alar group. Sporophyte not seen.

LUZON, height of land (provincial boundary) between Pililla, Rizal Province, and Macatunao, Laguna Province, *Bartlett 15205, 15206, 15209, 15212;* Rizal Province, Hinulugan Taktak (waterfall), near Antipolo, *Bartlett 15266, 15269a, 15279, 15281;* vicinity of Antipolo, *Bartlett 15290.*

Distribution: South India, Malay Peninsula, Annam, Borneo, Formosa, China, Japan.

On damp ledges. The relatively broad, flattened stems with the leaves widely spreading below and often congested in budlike clusters at the tips will separate this species at a glance. The local collections are not tinged with red, like specimens I have from Japan, but in other respects the plants are identical.

2. **ISOPTERYGIUM MINUTIRAMEUM** (C. M.) Jaeg. Plate 21, fig. 472.

Isopterygium minutirameum (C. M.) JAEG., Adumbr. 2 (1876–1877) 500.

Hypnum minutirameum C. M., Syn. 2 (1851) 689.

Autoicous; slender, feathery plants in thin mats, brownish green, slightly glossy. Stems creeping, irregularly pinnate, branches short, laxly complanate-foliate. Branch leaves horizontally spreading, ovate-lanceolate, gradually long-acuminate, entire or very minutely denticulate above, up to 1 mm long and 0.2 mm wide, very slightly asymmetrical; costa none or very short and double; cells linear, smooth, 3 to 4 µ wide and 12 to 18 times as long. Perichætial leaves filiform-acuminate, entire; seta 6 to 8 mm long; capsule horizontal or pendulous, narrowly ovoid, slightly asymmetrical and gibbous, urn 0.6 mm long, constricted below the mouth when dry; lid sharply conical.

LUZON, Benguet Subprovince, Baguio, *Williams 1717a;* Laguna Province, Mount Maquiling, *Robinson 17028, 17029, Holden 151, Williams 2070a* in part, *Bartlett 15607, 15690, 15710.*

Distribution: Sumatra, Java, Borneo, Australia, Fiji, Marquesas.

On dead wood and damp stones. A delicate little plant closely allied to *I. albescens*, but usually well marked by the darker color, narrower widely spreading branch leaves, and curved subpendulous capsule.

3. **ISOPTERYGIUM PENDULUM** Dix. Plate 21, fig. 433.

Isopterygium pendulum Dix. in herb.

Autoicum; gracile, intense viride, nitidum, laxe caespitosum. Caulis flexuosus, irregulariter pinnatim ramosus, ramis complanatis. Folia ovata, breviter acuminata, concava, superne serrulata, patentia; costa bina, brevis; cellulae anguste, rhomboidae, chlorophyllosae, alares nullae. Folia perichaetialia sensim anguste acuminata, fere integra; seta 12 to 15 mm longa, rubra; theca pendula, mamillosa; operculum e basi convexa breviter rostellatum, mamillosum.

Autoicous; slender, deep-green, glossy plants in lax tufts. Stems to 5 cm long, flexuose, creeping, irregularly pinnate, branches widely spreading, complanate-foliate. Leaves ovate, concave, short-acuminate, 0.8 mm long and 0.4 mm wide, lateral rows asymmetrical; margins erect, serrulate in upper half; costa short and double; cells narrowly rhomboidal, chlorophyllose, about 4 μ wide and 6 to 8 times as long, not differentiated at basal angles. Perichaetial leaves long acuminate, subentire; seta red, smooth, 8 to 15 mm long; capsule horizontal or pendulous, short-ovoid, mamillose, urn 1 mm long; lid mamillose, short-beaked from a convex base.

BATAN, Mount Iraya, *Bartlett 15464*. LUZON, Cagayan Province, Magapit, *Bartlett 14841, 14853, 14855, 14875*: Sitio Babayuan, *Bartlett 14898*: Rizal Province, Hinulugan Taktak (waterfall), *Bartlett 15946*: Benguet Subprovince, Bued Canyon, *Bartlett 13403*: Laguna Province, Mount Maquiling, *Herklots P. 25* in part (type): Cavite Province, Silang and Balete, *Bartlett 14787, 14788, 14789, 14807*: Zambales Province, Olongapo, Mount Kabalan, *Ebalo 36*.

Endemic.

Very distinct from the other species in the shortly pointed leaves and the shorter chlorophyllose cells. The exothecial cells and the cells of the lid are rounded and turgid on the free surfaces, somewhat as in *Trachythecium*, but this character is shared by other species of the genus, and its diagnostic value is problematical.

4. ISOPTERYGIUM ALBESCENS (Schwaegr.) Jaeg. Plate 17, fig. 174.

Isopterygium albescens (Schwaegr.) JAEG., Adumbr. 2 (1876–1877) 499.

Hypnum albescens SCHWAEGR., Suppl. pl. 1 3 fasc. 2 (1828) *pl.* 226

Autoicous; slender, delicate plants, pale yellow or silvery green, glossy, in thin mats. Stems creeping, to 3 cm long, more or less regularly pinnate, branches slightly flattened, laxly foliate. Leaves widely spreading, lateral rows asymmetrical, ovate-lanceolate, slenderly acuminate, concave, ecostate, entire or minutely toothed above, to 0.9 mm long; cells as in *I. minutiramеum*, alar cells few and poorly differentiated. Perichaetial leaves long and slenderly acuminate, erect; seta filiform, reddish, 15 to 18 mm long; capsule ovoid, turgid, horizontal, urn to 0.6 mm long.

LUZON, Benguet Subprovince, Baguio, *Fenix 12938*, *Williams 1705*, *Bartlett 13937*, a robust form; Mount Tonglon, *Ramos 5514*. MINDORO, Mount Halcon, *Merrill 5587*; Puerto Galera, *Bartlett 13844* in part. CATANDUANES, Dakulangpatag, *Ramos & Edaño 84397* in part. NEGROS, Oriental Negros Province, Canlaon Volcano, *Merrill 6818*.

Distribution: Himalayas, Ceylon, Sumatra, Java, Borneo, Celebes, Japan, Pacific islands to Hawaii.

On trees and decayed wood. This species is usually well characterized by the pale or whitish feathery tufts. The leaves are typically broader and more asymmetrical than those of *I. minutiramеum*.

5. ISOPTERYGIUM BANCANUM (Bryol. Jav.) Jaeg. Plate 17, fig. 175.

Isopterygium bancanum (Bryol. Jav.) JAEG., Adumbr. 2 (1876–1877) 508.

Hypnum bancanum Bryol. Jav., Bryol. Jav. 2 (1868) 188.

Autoicous; slightly larger than *I. albescens* and more yellowish green. Stems elongate, laxly pinnate, branches complanate-foliate, 2 mm wide with leaves. Leaves widely spreading, ovate lanceolate, gradually and broadly acuminate, concave, to 1.2 mm long and 0.4 mm wide, sharply serrulate in upper half; cells linear, 14:1 or 16:1. Perichaetial leaves entire, long-acuminate; seta 10 to 14 mm long, slender; capsule pendulous.

LUZON, Rizal Province, Montalban, *Bartlett 14508*, *14511*, *14598*: Bataan Province, Lamao River, *Williams 862*, *871*: Laguna Province, Mount Maquiling, *Bartlett 15641a*. CEBU, Lahug, *Nemenzo 20*. MINDANAO, Agusan Province, *Weber 1302*. JOLO, Bud Kaunayan, *Bartlett 16120*.

Distribution: Java, Banka.

On bark of trees and rocks. In addition to being appreciably larger than *I. albescens* this species is quite distinct in the minutely but sharply toothed leaf margins.

6. **ISOPTERYGIUM SAXENSE** Williams. Plate 29, fig. 476.

Isopterygium saxense WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 369.

Dioicous; slender, pale, yellowish-green plants in thin mats. Stems irregularly pinnate, branches short, complanate-foliate, 1.5 mm wide with leaves. Stem leaves to 1 mm long, ovate-lanceolate, ecostate, finely acuminate, subentire; branch leaves slightly smaller, more broadly acuminate, minutely serrulate in upper half; cells 5 to 6 μ wide and 8 to 10 times as long, scarcely differentiated at basal angles. Perichaetial leaves to 1.8 mm long, with slender, flexuose serrulate points. Seta about 12 mm long; capsule short-ovoid, pendulous, urn 0.8 mm long, exothecial cells turgid; peristome normal; lid convex with a short beak.

MINDANAO, Sax River, near San Ramon, *Williams 2164*.

Endemic.

On log. Differs from *I. bancanum* in the dioicous inflorescence and the smaller leaves.

166. Genus TAXIPHYLLUM Fleisch.

Taxiphyllum FLEISCH., Laubmfl. Java 4 (1922) 1434.

Medium-sized plants resembling *Plagiothecium*. Stems creeping, irregularly branched, very complanate-foliate. Leaves ovate-lanceolate, acuminate, serrulate nearly to base; cells linear-rhomboidal, usually minutely papillose at apical angles. Seta slender; capsule ovoid, inclined; lid rostrate.

TAXIPHYLLUM TAXIRAMEUM (Mitt.) Fleisch. Plate 29, fig. 477.

Taxiphyllum taxirameum (Mitt.) FLEISCH., Laubmfl. Java 4 (1922) 1435.

Stereodon taxirameus MITT., Journ. Linn. Soc. Suppl. 1 (Musc. Ind. Or.) (1859) 105.

Dioicous; bright-green or yellowish-green plants, usually with a vitreous lustre when dry, in thin mats. Stems creeping, irregularly branched, strongly complanate-foliate. Leaves rather crowded, widely spreading in bilateral rows, ovate-lanceolate, concave, usually short-acuminate but variable in this respect, sharply serrulate above and usually denticulate nearly to base, up to 1.6 mm long and 0.6 mm wide; costa short, double and indistinct; cells thin-walled, about 4 μ wide and 6 to 10 times as long, chlorophyllose, often minutely papillose at apical angles, shorter in apex. Sporophyte not seen.

LUZON, Rizal Province, Montalban, *Bartlett 14518, 14534, 14528;* Benguet Subprovince, Bued Canyon, *Bartlett 13402.* PANAY, Iloilo Province, *Robinson 18035, 18050, 18154.*

Distribution: Himalayas, Ceylon, Assam, Sumatra, Java, Formosa, Japan.

On moist ground. Variable in size and color but easily recognized by the strongly flattened stems and branches, up to 3.5 mm wide at times. Fruit very rare and sporophyte characters little known.

TAXIPHYLLUM TAXIRAMEUM (Mitt.) Fleisch. var. RECURVIFOLIUM (Ther.) Bartram comb. nov.

Taxiphyllum recurvifolium THERIOT, Bull. Soc. Bot. Geneve 26 (1936) 91.

Leaves more or less arched when dry, with decurved points.

LUZON, Bulacan Province, *Llanos.*

This form is not sharply defined and may have to be merged with the typical plant in a wider series of specimens.

167. Genus VESICULARIA (C. M.) C. M.

Vesicularia (C. M.) C. M., Flora 82 (1896) 407.
Omalia Subsection 1 *Vesicularia* C. M., Syn. 2 (1851) 233.

Medium-sized, usually dull-green plants in extensive mats. Stems elongate, mostly regularly pinnate, branches short, widely spreading, complanate-foliate. Leaves ovate, short- or long-acuminate, entire or weakly toothed; costa faint or none; cells (excepting *V. Miquelii*) lax, oval-rhomboidal, chlorophyllose, smooth. Sporophyte as in *Ectropothecium.*

Key to the species of Vesicularia.

1. Plants whitish or silvery green, glossy, perichætial leaves incised. 1. *V. Miquelii.*
Plants, dull, yellowish green, perichætial leaves not incised.................. 2.
2. Leaves with long, subulate-acuminate points.................. 2. *V. reticulata.*
Leaves short-acuminate .... 3.
3. Leaves ending in a short, sharp acumen, cells short........3. *V. Montagnei.*
Leaves ending in a wider acumen, cells elongate........... 4. *V. Dubyana.*

1. VESICULARIA MIQUELII (Bryol. Jav.) Fleisch. Plate 48, fig. 470.

Vesicularia Miquelii (Bryol. Jav.) FLEISCH., Laubm. Java 4 (1922) 1440.
Hypnum Miquelii Bryol. Jav. 2 (1867) 187.
Taxithelium argenteum BROTH., Philip. Journ. Sci. 31 (1926) 297.

Heteroicous; rather robust plants, pale or silvery green, very glossy when dry, in lax mats. Stems up to 6 cm long or longer, pinnately branched, branches widely spreading, 6 to 8 mm long, complanate-foliate. Stem leaves ovate, shortly subulate-acuminate; branch leaves shorter and more broadly acuminate, concave, ecostate, minutely denticulate toward apex, up to 1.3 mm long; cells very long and narrow, 4 to 5 μ wide and 15 to 20 times as long, short and lax across insertion. Perichætial leaves deeply incised on one or both sides above middle; seta to 2.5 or 3 cm long, slender, red; capsule inclined or horizontal, curved, ovoid cylindric, urn 1 mm long; lid conical, with a short beak.

LUZON, Cagayan Province, *Curran 16645, Ramos 7579*. POLILLO, *McGregor 10512, 10520*. LEYTE, Dagami, *Ramos 15395*. PANAY, Capiz Province, Jamindan, *Ramos & Edaño 30839*.

Distribution: Malay Peninsula, Sumatra, Java, Borneo, New Guinea.

On the barks of trees and exposed roots. A very attractive plant with a silvery sheen when dry. The long narrow leaf cells make this a very anomalous species in *Vesicularia*. In any logical redistribution of the hypnaceous genera it will no doubt be relocated or segregated in a new genus.

7. **VESICULARIA RETICULATA** (Doz. and Molk.) Broth. Plate 26, fig. 474.

Vesicularia reticulata (Doz. & Molk.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1909) 1094.
Hypnum reticulatum DOZ. & MOLK., M. Frond. Archip. Ind. (1844) 13.
Ectropothecium pilirete BROTH., Monsunia 1 (1900) 61.
Vesicularia filicuspes BROTH., Philip. Journ. Sci. § C 8 (1913) 88.

Autoicous; pale brownish-green plants, slightly glossy, in extensive mats. Stems to 5 cm long, laxly more or less irregularly pinnate, branches short, slightly flattened. Leaves curved when dry, widely spreading when moist, ovate, concave, gradually long-acuminate but very variable in length of acumen, entire or minutely toothed near apex, to 1.5 mm long and 0.6 mm wide; costa none or double, short and faint; cells narrowly oval-hexagonal, smooth, prosenchymatous, 8 to 14 μ wide and 3 to 8 times as long, marginal row narrower and rhomboidal. Inner perichætial leaves long and finely acuminate, entire; seta 1.5 to 2.5 cm long, curved at tip; capsule pendulous, ovoid, constricted under mouth when dry; lid conic-rostrate.

LUZON, Cagayan Province, Abalung Narig trail, *Weber 1591*; Magapit, *Bartlett 14848, 14849, 14856, 14877*; Nueva Vizcaya Province, Dupax, *McGregor 14840*; Bataan Province, Olongapo Naval Reservation, *Bartlett 14182*; Zambales Province, Pannubuan, *Bartlett 14214, 14217, 14222:* Laguna Province, Mount Maquiling, *Bartlett 15737:* Ilocos Sur Province, Barrio Nagsapawan, *Bartlett 14286, 14290:* Sorsogon Province, Irosin, Mount Rubusan, *Elmer 16877.* POLILLO, *McGregor 14940.* PALAWAN, Mount Gantung, *Edaño 80885.* MINDORO, Puerto Galera, *Bartlett 13588.* NEGROS, Oriental Negros Province, Cuerno de Negros, *Magdamo 84.* MINDANAO, Lanao Province, Pugaan Hill, *Bartlett 15892.* BILIRAN, *McGregor 18467.* JOLO, Bud Sungal, *Bartlett 16060, 16070, 16073, 16075.*

Distribution: Himalayas, Malay Peninsula, Sumatra, Java, Celebes.

Mostly on decayed wood, more rarely on soil. A variable species within reasonable limits. *V. filicuspes* Broth. and *V. piliretis* (Broth.) are not at all convincing as species. The distinguishing characters are unstable and seem of minor importance. I believe they are only forms of *V. reticulata.*

4. **VESICULARIA MONTAGNEI** (Bel.) Fleisch. Plate 20, fig. 404.

Vesicularia Montagnei (Bel.) FLEISCH., E. & P. Pflanzenfam. ed. 1 Musci (1909) 1094.

Pterygophyllum Montagnei BEL., Voy. Ind. Or. Bot. 2 Crypt. (1835) 85.

Hookeria Meyeniana HAMPE, Ic. Musc. (1844) *pl. 3.*

Autoicous; pale dull-green plants in lax thin mats. Stems to 8 cm long, rather regularly pinnate, branches widely spreading, more or less rigid, complanate-foliate. Leaves shrunken and curved when dry, widely spreading and flattened when moist, ovate, concave, rather abruptly short and sharply acuminate, entire or minutely denticulate above by projecting cell ends, stem leaves 1 to 1.2 mm long, branch leaves slightly smaller; cells very lax, oval-hexagonal, 10 to 14 wide and 3 to 6 times as long. Perichætial leaves long-acuminate, entire; seta 1.5 to 2 cm long, slender; capsule ovoid, horizontal, more or less gibbous at back.

Numerous collections from Luzon, Mindoro, Leyte, Panay, and Mindanao.

Distribution: Himalayas, Ceylon, Sumatra, Java, Amboina, Borneo.

On dead wood, shaded rocks, and in similar places. Although *V. Meyeniana* (Hampe) has been consistently maintained as a distinct species, I fail to find any characters by which it can be segregated from *V. Montagnei.* This species is separable from *V. reticulata* by the flatter branches and the more abruptly acuminate leaves with shorter points.

6. VESICULARIA DUBYANA (C. M.) Broth. Plate 26, fig. 151.

Vesicularia Dubyana (C. M.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1909) 1095.
Hypnum Dubyanum C. M., Syn. 2 (1851) 241.
Ectropothecium campylothecium BROTH., Philip. Journ. Sci. § C 3 (1908) 27.
Vesicularia splendida BROTH., Philip. Journ. Sci. § C 8 (1913) 89.

Autoicous; plants dull green or golden brown, in lax soft mats. Stems elongate, more or less regularly pinnate, branches complanate-foliate. Leaves ovate, broadly acuminate, short pointed, usually minutely denticulate toward apex, to 1.3 mm long; cells 6 to 10 μ wide and 7 to 10 times as long, narrowly rhomboidal. Perichætial leaves slightly denticulate above; seta 1.5 to 2 cm long; capsule ovoid, horizontal or pendulous.

LUZON, Cagayan Province, Mount Bawa, *Edaño 80929*: Benguet Subprovince, Baguio, *Williams 1708*, *Merrill 4923, 7854*: Rizal Province, Antipolo, *Robinson & Ramos 11875*; Montalban, *Bartlett 14417*; Hinulugan Taktak (waterfall), *Bartlett 15249*: Bataan Province, Lamao River, *Williams 867, 870*; Olongapo Naval Reservation, *Bartlett 14128*: Cavite Province, Silang and Balete, *Bartlett 14795*: Tayabas Province, Mauban, *Pastrana 20, 21, 25*.

Distribution: Java, Banka, Amboina.

On damp rocks and earth. I am strongly inclined to think that *V. campylotheca* (Broth.) and *V. splendida* Broth. are only forms of *V. Dubyana* modified by habitat conditions. The leaf points vary considerably in the degree of acumination and the cells in the ratio of length to breadth, but the intermediate gradations are usually found on the same plant.

168. Genus CTENIDIUM (Schimp.) Mitt.

Ctenidium (Schimp.) MITT., Linn. Soc. Journ. 12 (1869) 509.
Hypnum subgenus *Ctenidium* SCHIMP., Syn. ed. 1 (1860) 631.

Mostly slender, delicate plants in dense mats. Stems creeping, more or less regularly pinnate. Stem and branch leaves well differentiated, ovate-lanceolate from a broadly cordate base, acuminate, toothed all around; costa short and double or none; cells linear, often papillose at apical angles, subquadrate at basal angles in a small well-defined alar group. Seta elongate, nearly or quite smooth; capsule nodding or horizontal, ovoid, mostly gibbous at back; lid conical; peristome double, normal; calyptra often pilose.

Key to the species of Ctenidium.

1. Leaves plicate, minutely serrulate.......................... 1. *C. mindanense.*
   Leaves not plicate, strongly serrate.......................... 2.
2. Moderately robust plants, leaves slenderly acuminate........ 2. *C. lychnites.*
   Slender, delicate plants, leaves filiform-acuminate.......... 3. *C. luzonense.*

1. CTENIDIUM MINDANENSE Williams. Plate 25, fig. 432.

Ctenidium mindanense WILLIAMS, Bull. N. Y. Bot. Garden 8 (1914) 365.

Autoicous; small, glossy plants, yellowish green tinged with brown, in dense mats. Stems about 1 cm long, irregularly branched, branches ascending, 6 to 7 mm long, terete-foliate. Leaves crowded, laxly erect when dry, more spreading when moist, broadly ovate from a cordate base, concave, strongly plicate, abruptly subulate-acuminate, up to 0.8 mm long and 0.6 mm wide, minutely serrulate nearly to base; costa none or very short and double; cells about 3 µ wide and 10 to 12 times as long, minutely papillose at apical angles, alar cells few, shorter but poorly differentiated. Perichætial leaves slenderly acuminate, slightly toothed near base of acumen; seta smooth, 8 to 10 mm long; capsule inclined, short-ovoid, wide-mouthed, urn to 0.9 mm long; lid conic-rostrate, oblique; calyptra sparsely pilose.

MINDANAO, Sax River, *Williams 2392.*

Endemic.

On tree. Sharply distinct from the other local species in the plicate, minutely denticulate leaves.

2. CTENIDIUM LYCHNITES (Mitt.) Broth. Plate 24, fig. 401.

Stereodon lychnites MITT., Journ. Linn. Soc. Suppl. 1 Bot. (Musc. Ind. Or.) (1859) 114.

Ctenidium lychnites (Mitt.) BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1909) 1048.

Dioicous? Medium-sized, glossy plants, yellowish or golden green, in dense mats. Stems creeping, to 4 cm long, closely and more or less irregularly pinnate. Stem leaves from a broad, ovate, cordate-auriculate base abruptly narrowed to a slender, curved or flexuose, acuminate point, to 1.5 mm long and 0.5 mm wide, strongly and sharply serrate all around; cells linear, irregularly angular in the slightly decurrent auricles; branch leaves smaller, gradually long-acuminate from a narrower ovate base, sharply, irregularly and at times nearly spinose-serrate above. Perichætial leaves abruptly contracted to a long, narrow, serrulate acumen; seta 1.5 to 2 cm long, red; capsule large, ovoid-cylindric, gibbous at the back, urn to 2 mm long; lid sharply conical, about 1 mm long; calyptra not seen.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4939*; Mount Santo Tomas, *Williams 1710*, *Hadden 152*; Bontoc Subprovince, *Vanoverbergh 1275*. MINDORO, Puerto Galera, *Bartlett 13857*.

Distribution: Khasia, Nilghiri, Ceylon.

On rocks and trees. As represented by the Philippine collections, this species varies considerably in size. The branch leaves are strongly and irregularly serrate, but I find no leaves with spinose teeth approaching the illustration of *C. Forstenii* in the Bryologia Javanica.

4. CTENIDIUM LUZONENSE Broth. Plate 24, fig. 431.

Ctenidium luzonense BROTH., Philip. Journ. Sci. § C 8 (1913) 85.

Dioicous; slender, delicate plants in dense feathery tufts, yellowish green, glossy. Stems 1 to 2 cm long, closely pinnate, branches ascending, to 3 to 4 mm long. Stem leaves abruptly long filiform-acuminate from a broadly ovate, cordate base, to 1.2 mm long and 0.4 mm wide, serrate all around; branch leaves smaller, erect-spreading, narrowly lanceolate from a subcordate base, gradually long filiform-acuminate, sharply serrate nearly to base; cells narrowly linear, smooth, rectangular and lax in the small decurrent auricles of stem leaves but scarcely differentiated at basal angles of branch leaves. Perichætial leaves abruptly long filiform-acuminate, serrulate, often with several coarse teeth at base of acumen; seta to 2 cm long, red, smooth; capsule large, as in *C. lychnites*.

LUZON, Cagayan Province, Mount Tabuan, *Ramos 84585a*; Laguna Province, Mount Banahao, *Robinson 6605*; summit of Mount Maquiling, *Baker 7013*, a very lax form.

Endemic.

I doubt very much whether this is more than an extreme form of *C. lychnites*. The differences are only relative and not at all impressive.

42. Family HYLOCOMIACEÆ

Mostly robust, more or less rigid plants. Stems rather regularly pinnate or bipinnate, densely foliate. Leaves symmetrical, acuminate, toothed above, stem and branch leaves often well differentiated; costa double and well-defined, rarely single; cells linear, prosenchymatous, alar group often differentiated. Seta long, smooth; capsule large, ovoid, usually horizontal; lid conical, short: peristome perfect, hypnoid in structure.

Key to the genera of Hylocomiaceæ.

1. Capsule erect, peristome teeth smooth........................ 171. *Leptohymenium.*
   Capsule horizontal, peristome teeth striolate........................ 2.
2. Leaves falcate, ovate, acuminate........................ 169. *Gollania.*
   Leaves not falcate, broad, very short-pointed........................ 3.
3. Leaves secund, minutely denticulate........................ 170. *Foreauella.*
   Leaves spreading, coarsely toothed........................ 172. *Macrothamnium.*

169. Genus GOLLANIA Broth.

Gollania BROTH., E. & P. Pflanzenfam. ed. 1 Musci (1908) 1054.

Rather robust, glossy, densely tufted plants. Stems creeping, irregularly pinnate. Leaves crowded, slightly falcate, from a broad, concave base abruptly lanceolate-acuminate, acumen sharply serrate; costa double, well-defined; cells narrowly linear, minutely papillose at apical angles, short and angular in a small alar group. Seta elongate; capsule horizontal, ovoid; lid sharply conical; peristome normal.

GOLLANIA BENGUETENSE Broth. Plate 24, fig. 185.

Gollania benguetense BROTH., Philip. Journ. Sci. 31 (1926) 299.

Dioicous? Moderately large, golden-green glossy plants in dense soft mats. Stems irregularly pinnate and bipinnate, branches slightly flattened and hooked at tips. Leaves crowded, falcate, broadly ovate, concave, abruptly contracted to a rather short, wide, strongly toothed acumen, up to 2.5 mm long and 0.7 mm wide; costa double, distinct, extending about ⅓ up the leaf; cells linear with firm pale walls, 4 μ wide and 8 to 12 times as long, minutely papillose at apical angles, short, angular alar cells few in a small group. Sporophyte unknown.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Bartlett 13282;* Mancayan to Baguio, *Ramos & Edaño 40534* in part (type).

Endemic.

On rocks.

170. Genus FOREAUELLA Dixon and Varde

Foreauella DIXON & VARDE, Archiv. Bot. Bull. Mens. (2, 9) 1 (1927) 175.

Medium-sized, glossy plants in dense mats. Stems elongate, closely pinnate, branches short, tumid, blunt, strongly curved when dry. Leaves crowded, more or less secund, oblong-ovate, deeply concave, short-acuminate, lightly plicate; costa short and double; cells linear, rounded-quadrate in a small group at basal angles. Seta elongate, smooth; capsule inclined or horizontal.

FOREAUELLA ORTHOTHECIA (Schwaegr.) Dixon and Varde. Plate 18, fig. 496.

Foreauella orthothecia (Schwaegr.) DIXON & VARDE, Journ. Bot. (1937) 129.

Hypnum orthothecium SCHWAEGR., Suppl. pt. 1 3 fasc. 1 (1827) *pl.* 230*b*.

Leskea secunda HOOK., Ic. Pl. Rar. (1841) *pl.* 23, *fig.* 1.

Foreauella indica DIXON & VARDE, Archiv. Bot. Bull. Mens. (8, 9) 1 (1927) 175.

Autoicous; golden-green glossy plants in dense intricate mats. Stems to 6 cm long, creeping, densely pinnate, branches ascending, to 10 mm long, densely foliate, tumid, obtuse, strongly curved toward ends. Branch leaves erect, appressed and slightly secund when dry, oblong-ovate, short-acuminate, deeply concave, more or less cucullate at apex, 1 mm long and 0.4 mm wide, lightly plicate; margins narrowly reflexed, minutely denticulate toward apex; costa double, extending about ⅓ up the leaf; cells linear, 4 to 5 μ wide and 8 to 10 times as long, subquadrate in a small group at basal angles. Perichaetial leaves to 2.5 mm long, slenderly acuminate, minutely denticulate; seta to 2.5 cm long, curved at tip; capsule inclined or horizontal, oblong-ovate, wide-mouthed, urn 2 mm long; peristome teeth striolate, segments of endostome broad, carinate, with narrow apertures, from a high basal membrane. Lid and calyptra not seen.

LUZON, Benguet Subprovince, Baguio, *Williams 1707*; Bued Canyon, *Bartlett 13971*.

Distribution: Himalayas, southern India, Siam.

On rocks. This species has a very characteristic appearance from the short, crowded, tumid branches curved at the tips and often all pointing the same way. The complete synonymy is much more extensive than indicated here. In an attempt to definitely locate *Pylaisia secunda* (Hook.), to which Mr. Williams very properly referred his collection, I asked Mr. Dixon to look up the original collection at Kew. As a result it appears that the identical plant described and figured by Schwaegrichen was renamed *Pylaisia secunda* by Hooker, possibly with the thought that Schwaegrichen's name was inappropriate, as it is. The capsules are in reality short-oblong and strongly inclined.

171. Genus LEPTOHYMENIUM Schwaegr.

Leptohymenium SCHWAEGR., Suppl. pt. 1 3 fasc. 2 (1828) *pl.* 246.

Medium-sized, wiry plants in lax tufts or mats. Primary stems elongate, creeping, secondary stems ascending, flexuose, bipinnate, branches slender and slightly curved. Leaves of secondary stems divaricately spreading, broadly ovate, short-acuminate, serrate above, ultimate branch leaves much smaller and erect-spreading; costa double, well defined; cells linear, slightly papillose at apical angles, lax and hyaline at basal angles. Perichætium large; seta elongate; capsule erect; peristome teeth smooth, segments of endostome narrow, from a rather high basal membrane; lid conic-rostrate.

LEPTOHYMENIUM TENUE (Hook.) Schwaegr. Plate 28, fig. 467.

Leptohymenium tenue (Hook.) SCHWAEGR., Suppl. pt. 1 3 fasc. 2 (1828) *pl.* 246.

Neckera tenuis HOOK., Trans. Linn. Soc. 9 (1808) 315.

Dioicous; pale golden-yellow plants, slightly glossy, in lax mats. Primary stems creeping, flexuose, naked; secondary stems numerous, ascending, wiry, closely bipinnate above, ultimate branches slender, curved, densely foliate, more or less attenuate at tips. Leaves dimorphous, those of secondary stems horizontally spreading, broadly ovate, abruptly short-acuminate, slightly concave, decurrent at basal angles, 1.5 mm long and over 1 mm wide, sharply serrate above; costa double, often extending nearly to midleaf; cells linear, minutely papillose at apical angles; leaves of ultimate branches much smaller, erect spreading, concave, sharply serrate in upper half. Perichætial leaves with long, flexuose, undulate points minutely denticulate above; seta slender, flexuose, up to 3 cm long or longer; capsule large, erect, ovoid-cylindric, urn 3 mm long; peristome teeth pale brown, smooth; lid 1.5 mm long, slenderly beaked from a conical base; spores papillose, 20 to 25 µ.

LUZON, Benguet Subprovince, Pauai, *M. S. Clemens 9316*; Mount Pulog, *Curran, Merritt, & Zschokke 16426*.

Distribution: Northern India, Khasia, Burma.

On trees. The crowded, slightly curved or flexuose branches give this species something of the appearance of *Foreauella orthothecia*, but the ultimate branches are much more slender and attenuate and the leaves not or scarcely secund. Under a microscope the erect sharply serrate leaf margins are thoroughly diagnostic, and the erect capsules, when present, are very characteristic.

172. Genus MACROTHAMNIUM Fleisch.

Macrothamnium FLEISCH., Hedwigia 44 (1905) 307.

Moderately robust, rigid plants in lax tufts, slightly glossy. Primary stems creeping, naked, secondary stems ascending, usually simple below, irregularly bipinnate above. Leaves polymorphous; stem leaves broadly cordate-ovate, short-pointed; branch leaves smaller, broadly ovate, coarsely serrate; costa double; cells linear, laxer across insertion and at basal angles. Perichætium large; seta long and smooth; capsule large, inclined or pendulous; lid convex with a short beak; peristome normal.

Key to the species of Macrothamnium.

Stem leaves not decurrent or auriculate; finely toothed.... 1. *M. macrocarpum.*
Stem leaves decurrent and auriculate, coarsely spinose-serrate.
2. *M. javense.*

1. **MACROTHAMNIUM MACROCARPUM** (Reinw. and Hornsch.) Fleischer. Plate 29, fig. 478.

Macrothamnium macrocarpum (REINW. & Hornsch.) FLEISCHER, Hedwigia 44 (1905) 306.

Hypnum macrocarpum REINW. & HORNSCH., Nov. Act. Acad. Caes. Leop. 14 Suppl. 2 (1828) 725.

Variable in size and habit but usually robust, wiry plants, golden or yellowish green, slightly glossy. Primary stems elongate; secondary stems ascending, simple below, copiously bipinnate and tripinnate above, ultimate branches slender, attenuate, flexuose. Leaves of secondary stems large, squarrose-spreading, broadly ovate from a cordate base, not decurrent, abruptly contracted to a short oblique point, lightly striate, to 2 mm long and over 1 mm wide; margins plane, sharply and minutely serrate in upper half; costa double, faint, extending about ⅓ up the leaf; cells linear-rhomboidal, 4 to 6 μ wide and 6 to 8 times as long, laxer across insertion and in basal angles but not forming a distinct alar group; branch leaves progressively smaller, erect-spreading, concave, serrate nearly to base. Inner perichætial leaves gradually long-acuminate, slightly plicate, acumen distantly and irregularly serrate with slender, cilialike teeth; seta to 5 cm long, slender, smooth, curved at tip; capsule large, mostly horizontal, ovoid-cylindric, more or less curved and gibbous at the back, urn 2 to 2.5 mm long; lid sharply conical; peristome large, teeth striolate, segments of endostome from a high basal membrane, keeled, intermediate cilia 3 or 4, nodose.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4878, Hadden 158, Baconi 16017, Ramos 5966;* Mount Santo Tomas, *Williams 1709, Hadden 153.*

Distribution: Eastern India, Ceylon, Sumatra, Java, Borneo, Hawaii.

On trees in high mountain forests. A handsome, luxuriant moss easily recognized by the much-branched secondary stems with the branches often curved in one direction. The broad, squarrose-spreading stem leaves are noticeably different from the smaller erect-spreading leaves of the ultimate branches.

2. **MACROTHAMNIUM JAVENSE** Fleisch. Plate 27, fig. 134.

Macrothamnium javense FLEISCH., Hedwigia 44 (1905) 311.

Phyllodioicous? Luxuriant plants with abundantly branched secondary stems, closely resembling *M. macrocarpum* in habit and color. Stem leaves broadly cordate-ovate, very short-pointed, decurrent and auriculate at base; margins coarsely and irregularly spinose-serrate in upper half; cells linear, lax, hyaline, in a well marked convex group at basal angles and irregular and angular in rounded-decurrent auricles; leaves of ultimate branches less than 0.5 mm long, ovate, short-acuminate, concave, spinose-serrate above middle. Sporophyte as in *M. macrocarpum*.

LUZON, Laguna Province, Mount Banahao, *Robinson 6596*, *Copeland "AD," 827*.

Distribution: Sumatra, Java, Celebes, Borneo.

If the stem leaves are examined with care there should be no difficulty in separating this species from *M. macrocarpum*. The basal auricles are conspicuous and the margins very coarsely toothed.

2. Tribe NEMATODONTEÆ

Peristome teeth solid, not transversely articulated (faintly barred only in *Buxbaumia*); developed from several concentric rows of cells of sporogonium.

43. Family BUXBAUMIACEÆ

Small gregarious plants. Stems very short, densely foliate or almost leafless. Seta short or elongate; capsule relatively large, oblique, oddly shaped, asymmetrical; lid conical; calyptra small and fugacious; peristome single or double, teeth when present linear, faintly barred, developing from several concentric layers of cells, endostome a pale, plaited, conical membrane open at top.

Key to the genera of Buxbaumiaceæ.

Seta elongate, thick, leaves few or none.............................. 173. *Buxbaumia*.
Seta very short or none, capsule immersed in a large perichætium.
174. *Diphyscium*.

173. Genus BUXBAUMIA Hedw.

Buxbaumia HEDW., Sp. Musc. (1801) 166.

Dioicous; minute plants. Stems scarcely 1 mm high. Leaves very small, developing long filaments from marginal cells, ecostate, laxly areolate. Seta elongate, stout, scabrous; capsule oblique, ovoid, flattened on upper face, brown; peristome double, teeth short and filiform, in one to several irregular rows, endostome a high, conical, plaited membrane.

BUXBAUMIA JAVANICA C. M. Plate 25, fig. 490.

Buxbaumia javanica C. M., Syn. 1 (1849) 152.

Very small plants growing on a mat of brownish protonema. Leaves of fruiting plants minute, marginal cells developing hyaline filaments which finally form a dense felt enclosing vaginula. Seta 1 to 1.5 cm long, stout, slightly curved, very scabrous; capsule large, inclined, ovoid, narrowed to a small mouth, flattened above, with a short, thick neck, up to 5 mm long and 3 mm wide; lid conical, short; peristome teeth filiform, in 2 to 4 rows, endostome pale, papillose, longer than teeth.

NEGROS, Canlaon Volcano, *Merrill 6885*.

Distribution: Java.

On trees. This curious moss is apparently very rare in the Philippines. It is not suggestive of a moss, except to a bryologist, and is likely to be mistaken for a fungus or an insect shell. The unique capsule, out of all proportion to the size of the plant, cannot be mistaken for anything else after it has become familiar.

174. Genus DIPHYSCIUM Mohr

Diphyscium MOHR, Obs. Bot. (1803) 34.

Small, gregarious plants. Stems short. Leaves lingulate or narrowly spathulate, obtuse or acuminate; costa single, strong; leaf cells rounded, in 2 or 3 layers. Perichætial leaves large, with long-aristate points; capsule immersed, oblique, on a very short seta, conic-ovoid, gibbous, small-mouthed; peristome apparently single, teeth none or very rudimentary, endostome a pale membrane with 16 longitudinal plaits.

Key to the species of Diphyscium.

Stem leaves entire .... 1. *D. involutum.*
Stem leaves toothed .... 2. *D. rupestre.*

1. **DIPHYSCIUM INVOLUTUM** Mitt. Plate 26, fig. 491.

Diphyscium involutum MITT., Journ. Linn. Soc. Suppl. 1 Bot. (Musc. Ind. Or.) (1859) 149.

Webera integerrima BROTH., Leafl. Philip. Bot. 2 (1909) 653.

Autoicous? Small, densely gregarious plants, brownish green. Stems 2 to 4 mm high, densely foliate. Leaves erect-spreading, slightly contorted when dry, oblong-spathulate from an ovate membranous base, obtuse, mucronate, entire, to 6 mm long and 1.1 mm wide; costa brown, wide and indistinct below, tapering upward and ending in mucro; cells minute, rounded or angular, 7 to 8 µ, in two layers, several rows at margins slightly smaller, basal cells rectangular, hyaline. Perichætial leaves pencillate, outer gradually narrowed to a long-aristate point formed by excurrent costa, inner membranous and retuse at apex, long aristate; capsule nearly sessile, immersed in perichætium.

LUZON, Rizal Province, Mount Lumutan, *Ramos & Edaño 29828*; Bataan Province, upper Lamao River, *Williams 825*; Laguna Province, Mount Maquiling, *Robinson 17016, 17025*, *Bartlett 15639*. NEGROS, Oriental Negros Province, Cuernos Mountains, Dumaguete, *Elmer 10242*.

Distribution: Khasia, Ceylon.

On rocks. I fail to separate *D. integerrima* (Broth.) from *D. involutum* by any constant difference in the length of the leaf mucro which is frequently developed to a greater or lesser degree on leaves of the same plant. Any variation in the length of the stems from 2 to 4 mm is a minor factor of little or no specific value.

2. DIPHYSCIUM RUPESTRE Doz. and Molk. Plate 30, fig. 442.

Diphyscium rupestre DOZ. & MOLK., Pl. Jungh. (1854) 340; Bryol. Jav. 1 (1855) 34.

Webera Elmeri BROTH., Leafl. Philip. Bot. 2 (1909) 654.

Autoicous? Small gregarious plants differing but slightly from *D. involutum* in appearance. Leaves spathulate-lingulate, slightly narrowed above the short, ovate, membranous base, acute or very short-acuminate, to 9 mm long and 1 mm wide, slightly fragile; margin thickened, distinctly sinuate dentate in upper half; costa tapering upwards and ending in apex; cells rounded, incrassate, in two layers, 3 to 5 rows at margins darker colored, in 3 layers forming a narrow, rather conspicuous border extending nearly to base, basal cells hyaline, rectangular; upper leaves with aristate points. Perichætial leaves as in *D. involutum*; capsule immersed.

LUZON, Laguna Province, Mount Maquiling, *Baker 2595*. POLILLO, *Leiberg 12361*. NEGROS, Oriental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 10057*.

Distribution: Java, Borneo.

On damp banks and rocks. These collections are identical in structure and represent one species. The Negros plants seem to be only a robust form of *D. rupestre*, as I understand it, which differs from *D. involutum* mainly in the toothed margins of the stem leaves.

44. Family POLYTRICHACEÆ

Medium-sized to very robust terrestrial plants with erect, simple or sparingly branched stems. Leaves narrow, mostly rigid, blade usually well differentiated from sheathing base; costa strong, percurrent or excurrent, often toothed on back above, usually broader on ventral surface and covered with thin, parallel, longitudinal lamellæ. Seta elongate; capsule erect or inclined, cylindrical or angled; peristome single, teeth 32 or 64, solid, not barred, triangular in cross section, columella bearing an expanded shieldlike membrane at apex covering mouth of capsule; calyptra cucullate, usually more or less pilose with erect or deflexed hairs.

Key to the genera of Polytrichaceæ.

1. Seta papillose, leaves without lamellæ........................ 2.
   Seta smooth, leaves with lamellæ........................ 3.
2. Leaves strongly toothed, cells lax, parenchymatous.
   176. *Pseudoracelopus.*
   Leaves subentire, cells elongate, prosenchymatous.......... 177. *Racelopus.*
3. Leaves more or less lamellate on back .... 178. *Oligotrichum.*
   Leaves without dorsal lamellæ........................ 4.
4. Leaves with a thickened border, calyptra nearly naked.... 175. *Atrichum.*
   Leaves not bordered, calyptra densely pilose................ 179. *Pogonatum.*

175. Genus ATRICHUM P. Beauv.

Atrichum P. Beauv., Prodr. (1805) 42.

Medium-sized plants in loose tufts. Leaves lingulate or oblong-ovate, with a thickened, toothed border, from a slightly clasping but not sheathing base; costa narrow, with few lamellæ on ventral face. Seta elongate, smooth; capsule cylindric, more or less curved; peristome teeth 32; calyptra naked, rarely sparsely pilose.

Key to the species of Atrichum.

Synoicous, lamellæ 5 or 6 cells high........................ 2. *A. flavisetum.*
Autoicous, lamellæ 1 to 3 cells high........................ 1. *A. undulatum.*

1. **ATRICHUM UNDULATUM** (Hedw.) P. Beauv. Plate 26, fig. 132.

Atrichum undulatum (Hedw.) P. Beauv., Prodr. (1805) 42.
Polytrichum undulatum Hedw., Sp. Musc. (1801) 98.

Autoicous; fertile stems proliferous from center of male flower. Plants loosely tufted, dull green. Stems erect, to 2 cm high or higher. Lower leaves very small, gradually larger upward, upper leaves long, lingulate, more or less transversely undulate above, strongly crisped and contorted when dry, bluntly pointed, with a narrow cartilaginous border of linear, brownish cells, to 6 mm long and 1 mm wide, usually with spines along undulations on dorsal side of lamina; margins distantly spinose in upper half, with teeth often in pairs; costa strong but relatively narrow, ending in apex, toothed on back above, with 2 to 4 low lamellæ or ridges, 1 to 3 cells high, on ventral surface; upper cells irregularly rounded-hexagonal, 18 to 22 µ in diameter, often transversely oval, gradually rectangular below. Seta erect, to 2 cm long or longer; capsule slightly inclined and curved, cylindrical, to 5 mm long; lid long-beaked from a conical base; calyptra narrow, pale, scabrous above; peristome teeth long, obtuse.

LUZON, Benguet Subprovince, Baguio, *Williams 1798*.

Distribution: Wide in the north temperate zone, also in Japan, China, and Cochinchina.

On earth walls. These plants show the peculiar inflorescence and low lamellæ characteristic of *A. undulatum*. More local collections are needed to clarify this group.

2. **ATRICHUM FLAVISETUM** Mitt. Plate 23, fig. 491.

Atrichum flavisetum MITT., Journ. Linn. Soc. Suppl. 1 Bot. (Musc. Ind. Or.) (1859) 150.

Paroicous; antheridia in a gemmiform cluster enclosed in the perichætial leaves. Resembling *A. undulatum* in size, habit and leaf structure. Costa with four lamellæ on ventral face, 5 or 6 cells high.

LUZON, Benguet Subprovince, Baklan to Kabayan, *Merrill 4947*.

Distribution: Himalayas, Japan.

On banks. As far as this solitary collection is concerned, the plants appear to be distinctive in the inflorescence and the stronger lamellæ up to 5 or 6 cells high. How constant these distinctions will prove in a wider series of specimens remains to be demonstrated.

176. Genus PSEUDORACELOPUS Broth.

Pseudoracelopus BROTH., Philip. Journ. Sci. § C 5 (1910) 150.

Gregarious plants. Leaves lanceolate or lingulate, bluntly toothed above, not lamellate; costa ending below apex; cells lax.

parenchymatous, smooth. Seta elongate, strongly papillose throughout; capsule nodding, wide-mouthed; peristome teeth 32; lid convex, short, bluntly pointed; calyptra densely felted with deflexed hairs, covering entire capsule.

Key to the species of Pseudoracelopus.

Leaves obtuse, incurved when dry.................................... 1. *P. philippinensis.*
Leaves filiform-acuminate, erect when dry .... 2. *P. mindanensis.*

1. **PSEUDORACELOPUS PHILIPPINENSIS** Broth. Plate 29, fig. 495.

Pseudoracelopus philippinensis BROTH., Philip. Journ. Sci. § C 5 (1910) 150.

Dioicous; dull brownish-green plants. Stems erect, 12 to 14 mm high, simple. Lower leaves small, gradually larger upward, upper leaves oblong-lingulate from a short indistinct base, obtuse, incurved when dry, more erect-spreading when moist, slightly concave, to 4 mm long and 1 mm wide; margins erect, irregularly and bluntly serrate in upper half; costa very stout, brown, ending below apex, without lamellæ, smooth on both sides; upper cells rounded, slightly angular, 20 to 25 μ in diameter, with irregularly thickened walls, rectangular, hyaline and delicate toward base. Seta 1.5 to 2 cm long, papillose; ochrea long, projecting above perichætial leaves; capsule mostly inclined, oblong-cylindric, contracted below flaring mouth; peristome teeth orange-brown with a hyaline, finely papillose border; lid plano-convex, mamillose; calyptra densely pilose.

LUZON, Cagayan Province, *Ramos 7572, 7576;* Camarines Sur Province, Botol River, *Edaño 84262.*

Distribution: Fiji.

On soil. This is a very interesting plant, closely allied to *Racelopus* in some respects but widely different in the obtusely pointed, toothed leaves and the lax parenchymatous leaf cells. It has recently been collected from several stations in Fiji and seems partial to tough clay soil.

2. **PSEUDORACELOPUS MINDANENSIS** Bartram sp. nov. Plate 29, fig. 496.

Caulis perbrevis. Folia erecta, lanceolata, longe piliformiter acuminata, superne grosse et irregulariter dentata; cellulae superiores parenchymaticae, subrectangulares, 20 ad 25 μ latae et 35 ad 75 μ longae; costa tenuissima. Seta 2 ad 2.5 cm longa, ubique papillosa; theca inclinata.

Probably dioicous. Small gregarious plants growing from a persistent mat of green protonema. Stems very short, 2 to 3 mm high. Leaves few, erect, upper about 3 mm long, lanceolate, gradually narrowed to a long capillary point, lower leaves much smaller and more abruptly pointed; margins plane, coarsely and irregularly toothed near base of acumen; costa very thin and faint, poorly defined below, slender above and ending in or just below base of acumen, smooth on both sides; upper cells parenchymatous, subrectangular with thin delicate walls, up to 25 μ wide and 35 to 75 μ long, more elongate toward base. Perichætial leaves to 5 mm long, with long capillary points; ochrea projecting conspicuously above perichætium; seta 2 to 2.5 cm long, papillose throughout; capsule inclined, oblong-cylindric, with 6 sharp ridges or striæ; peristome teeth short, blunt, with an orange-red axis and broad, hyaline, papillose borders; calyptra densely pilose.

MINDANAO, Bukidnon Province, near Silipan, *L. H. Phillips 14*. Endemic.

On rocks. These little plants have much the appearance of *Racelopus pilifer* to the naked eye, but under a microscope the coarsely toothed leaf margins and broad, lax leaf cells are clearly diagnostic. I feel reasonably confident that the species belongs in *Pseudoracelopus*, but the capillary leaf points are in bold contrast to the obtusely pointed leaves of *P. philippinensis*.

177. Genus RACELOPUS Doz. and Molk.

Racelopus Doz. & MOLK., Bryol. Jav. 1 (1855) 37.

Small, pale-brown, gregarious plants. Stems simple, very short. Leaves small below, gradually larger upward, ovate-lanceolate, subulate-acuminate, subentire; costa poorly defined, ending in acumen, without lamellæ; cells elongate, prosenchymatous, narrowly hexagonal, smooth. Perichætial leaves large, filiform-acuminate; seta long, papillose; capsule erect or inclined, oblong-cylindric; peristome teeth 32; lid conic-rostrate.

RACELOPUS PILIFER Doz. and Molk. Plate 29, fig. 497.

Racelopus pilifer Doz. & MOLK. Bryol. Jav. 1 (1855) 37.

Dioicous; stems erect, 2 to 3 mm high. Leaves few, rigidly erect when dry, erect-spreading when moist, upper ovate, subulate-acuminate, to 3.5 mm long and 1 mm wide, much smaller below; margins plane, more or less sinuate-denticulate toward base of acumen or subentire; costa broad and thin, not well defined, without lamellæ, ending in brownish acumen; cells smooth, lax, pale, delicate, irregularly long-hexagonal, 12 to 15 μ wide. Perichætial leaves much larger, to 6 mm long, gradually narrowed to a filiform acumen, more or less strongly toothed above; seta 1.5 to 2 cm long, coarsely papillose except at extreme base; capsule inclined with age, oblong-cylindric, contracted below flaring mouth; peristome teeth short, blunt, with a broad hyaline border; lid short conic-rostrate; calyptra densely felted with deflexed hairs; spores pale, smooth, 5 to 6 µ.

LUZON, Bataan Province, Lamao River, *Williams 827*: Nueva Ecija Province, Bongabong, *Santos 304*: Tayabas Province, Atimonan, *Merrill 2909*: Laguna Province, San Antonio, *Ramos 16668*: Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16084*. PANAY, Capiz Province, Jamindan, *Ramos & Edaño 30964*.

Distribution: Siam, Tonkin, Sumatra, Java, Amboina, Borneo, New Guinea.

Mostly on soil and rocks. Sharply distinct from *Pseudoracelopus* in the subentire leaves with elongated cells.

178. Genus OLIGOTRICHUM Lam. and de Cand.

Oligotrichum LAM. & DE CAND., Flor. franc. 3 ed. 2 (1815) 491.

Slender, laxly tufted plants. Stems erect, simple, from a rhizomatous base. Leaves narrowly lanceolate, distantly toothed above, with longitudinal lamellæ on both ventral and dorsal sides. Capsule suberect, oblong-ovate; peristome teeth short and unequal; calyptra large, very sparsely pilose.

OLIGOTRICHUM ALIGERUM Mitt. Plate 39, fig. 496.

Oligotrichum aligerum MITT., Journ. Linn. Soc. 8 (1864) 48.

Dioicous; male flower discoid. Dull, brownish-green plants in loose tufts. Stems to 1.5 cm long, radiculose at extreme base. Lower leaves small, larger and crowded above, strongly contorted with incurved points when dry, erect-spreading when moist, narrowly lanceolate, short-acuminate, to 3.5 mm long, with short, scattered, serrated lamellæ on back above; costa stout, dilated upward, lamellate on both sides; cells rounded or transversely oval, thin-walled, smooth. Seta 2 to 3 cm long, slender, smooth; capsule oblong-cylindric, slightly inclined; calyptra about 3 mm long, stramineous, with a few scattered, erect hairs.

LUZON, Benguet Subprovince, Mount Santo Tomas, *Clemens 51918*, *Bartlett 13321* in part.

Distribution: Western North America, Japan.

Distinguished from all the other local polytrichaceous species by the serrate lamellæ on the back of the leaf blade. The presence of this plant in the mountains of Luzon is a distinct surprise. It has evidenly migrated through Japan and may be found in Formosa.

179. Genus POGONATUM P. Beauv.

Pogonatum P. BEAUV., Prodr. (1805) 84.

Mostly dioicous; small to very robust plants, laxly tufted. Stems erect, stiff, often tough and woody, mostly simple, densely foliate. Lower leaves small, larger upward, more or less spreading and often strongly contorted when dry, lanceolate from a more or less sheathing base, serrate above, usually with numerous longitudinal lamellæ on ventral face; costa dilated upward, often toothed on back near apex; basal cells elongate, narrowly rectangular, mostly hyaline. Seta long, smooth; capsules erect or inclined, cylindrical; lid rostrate; calyptra densely felted with long, deflexed hairs; peristome teeth 32.

Key to the species of Pogonatum.

1. Stems less than 5 mm high, perichætial leaves very long, leaves without lamellæ .... 1. *P. spinulosum.*
   Stems over 5 mm high, perichætial leaves not differentiated, leaves usually lamellose .... 2.
2. Leaves erect, rigid, border cells of lamellæ strongly differentiated........ 3.
   Leaves contorted when dry, border cells of lamellæ scarcely differentiated .... 4.
3. Border cells of lamellæ round, thickened, papillose .... 11. *P. Wallisii.*
   Border cells of lamellæ divided, smooth .... 10. *P. microstomum.*
4. Relatively small plants, stems to 3 cm high .... 5.
   Robust plants, stems usually 10 cm high or higher........ 8.
5. Lamellæ few, occupying about half width of blade... 5. *P. nudiusculum.*
   Lamellæ numerous, covering nearly all of blade........ 6.
6. Border cells of lamellæ flat or notched, leaves sharply serrate.
   4. *P. Junghuhnianum.*
   Border cells of lamellæ rounded, leaves bluntly toothed........ 7.
7. Leaves toothed at apex and costa toothed on back.... 3. *P. microphyllum.*
   Leaf margin sinuate, scarcely toothed, costa smooth on back.
   2. *P. obtusum.*
8. Lamellæ none or rudimentary, lamina cells of blade in several layers.
   7. *P. macrophyllum.*
   Lamellæ 1 to 6 cells high, lamina cells of the upper blade in one layer .... 9.
9. Lamellæ 1 or 2 cells high, confined to costa .... 6. *P. gymnophyllum.*
   Lamellæ 2 to 5 cells high, covering most of blade........ 10.
10. Lamellæ 3 to 6 cells high, leaf margins spinose.... 9. *P. spurio-cirratum.*
    Lamellæ 2 or 3 cells high, leaf margins serrate... 8. *P. Teysmannianum.*

1. POGONATUM SPINULOSUM Mitt. Plate 19, fig. 409.

Pogonatum spinulosum MITT., Journ. Linn. Soc. 8 (1865) 156.

Small, gregarious, pale-brown plants, growing from persistent green protonema, very much like *Racelopus* in appearance. Stems erect, 1 to 2 mm high. Lower leaves about 1 mm long, ovate, margins coarsely spinose-serrate; upper leaves much larger, to 5 mm long, ovate, concave, cuspidate by excurrent costa; margins sparingly sinuate-toothed near apex; costa strong, brown, without lamellæ, excurrent in a stout, brown, more or less toothed, cuspidate point; cells lax, narrowly hexagonal, irregular, 10 to 15 µ wide and 3 to 7 times as long, narrower and hyaline toward base. Perichætial leaves large, to 8 mm long, gradually lanceolate from a laxly areolate, sheathing base; costa excurrent in a short, denticulate, brown point. Seta 15 to 18 mm long, reddish, smooth, often two from one perichætium; capsule erect, cylindric, minutely and sharply papillose; lid short-beaked from a convex base; calyptra large, covering entire capsule, very densely felted; peristome teeth with a narrow colored axis and wide hyaline margins.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4973*.

Distribution: China, Japan.

On steep slope in pine forest. An unmistakable plant easily distinguished by its small size and the lack of lamellæ. As the leaves decrease in size downward the toothing of the margins becomes progressively stronger.

1. POGONATUM OBTUSUM (C. M.) Jaeg. Plate 23, fig. 500.

Pogonatum obtusum (C. M.) JAEG., Adumbr. 1 (1873-1874) 727.
Polytrichum obtusum C. M., Linnæa 37 (1872) 171.

Short, reddish-brown plants. Stems less than 1 cm high. Upper leaves crowded, slightly curved when dry, erect-spreading when moist, to 4 mm long, broadly lanceolate from a expanded, brownish, slightly clasping base, obtuse; margins slightly sinuate in upper half, especially near apex; costa percurrent, smooth on back, densely lamellose on ventral face, lamellæ 6 to 9 cells high, terminal cell oval in cross section, basal cells short-rectangular with firm yellowish walls, cells of blade small, rounded-quadrate. Seta about 10 mm long; capsule more or less inclined, ovoid, smooth, exothecial cells convex on free surface but not mamillose; calyptra pale brown.

Philippines: without definite locality. *Cuming 2215*.

As Thériot has noted, this plant is well distinguished from *P. microphyllum* by the faintly toothed or sinuate leaf margins, the costa smooth on the back, the capsules without striæ, and the exothecial cells convex rather than mamillose.

No further collections have been made that I am aware of, and the same question of origin is presented as in the case of *Campylopus percristatus*.

3. POGONATUM MICROPHYLLUM (Doz. and Molk.) Bryol. Jav. Plate 29, fig. 301.

Pogonatum microphyllum (Doz. & Molk.) Bryol. Jav., Bryol. Jav. 1 (1856) 40.

Polytrichum microphyllum Doz. & Molk., Fl. Jungh. (1854) 326.

Rather short ruddy-brown plants. Stems to 2 cm high, simple. Upper leaves solid, crowded, erect, incurved when dry, more open when moist, to 5 mm long, concave, lanceolate from a broad, yellowish, slightly sheathing base, bluntly pointed, with a few salient teeth near apex but otherwise entire; costa strong, brown, percurrent, with one or two teeth on back near extreme apex, covered on broad ventral face with numerous lamellæ 5 to 7 cells high, terminal cell oval and rounded in cross section; basal cells short-rectangular, pellucid, cells of blade small, rounded, very incrassate. Seta 10 to 12 mm long, more or less curved; capsule slightly inclined, urn about 2 mm long, often distinctly striate, exothecial cells mamillose; lid plano-convex, short-apiculate.

NEGROS, Canlaon Volcano, *Merrill 6815, 6830*.

Distribution: Java.

On volcanic soil. Merrill notes with reference to *No. 6815* that these are the highest plants on the active cone and grow on earth, old crater bottom, slopes, and ravines. The species typifies a more rigid, robust plant than *P. Junghuhnianum* with less strongly toothed leaves.

4. POGONATUM JUNGHUHNIANUM (Doz. and Molk.) Bryol. Jav. Plate 29, fig. 302.

Pogonatum Junghuhnianum (Doz. & Molk.) Bryol. Jav., Bryol. Jav. 1 (1856) 41.

Polytrichum Junghuhnianum Doz. & Molk., Fl. Jungh. (1854) 323.

Polytrichum albo-marginatum C. M., Linnaea 37 (1872) 172.

Medium-sized, laxly tufted plants, dull brownish green. Stems 1.5 to 3 cm long, rarely up to 4 to 5 cm, often felted with pale tomentum at base. Lower leaves small, gradually larger upward, upper leaves incurved when dry, erect-spreading when moist, ovate-lanceolate from an erect, pale, lightly sheathing base, bluntly acute, sharply and remotely toothed about halfway down blade; costa reddish brown, percurrent, toothed on back near apex, very broad on ventral face and covered with lamellæ 4 to 7 cells high, in section showing terminal cell flat or slightly notched; basal cells colorless or tinged with brown, cells of blade small, transversely oval. Seta 2 to 3 cm long; capsule slightly inclined, oblong-cylindric, constricted under mouth when dry, minutely papillose; spores pale, 10 to 12 μ.

LUZON, representative collections from numerous localities. Apparently frequent in the mountains. MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *M. S. Clemens 945*; Bukidnon Province, Mount Lipa, *Ramos & Edaño 37163*; Mahilucot River, *Ramos & Edaño 37162*.

Distribution: Sikkim, Siam, Java, Celebes, Borneo.

On clay banks. The white margin of the leaf blade, which Müller emphasizes in the description of *P. albo-marginatum*, is an intangible character and seems to show equally well in the young leaves of authentic specimens of *P. Junghuhnianum*. It is in no sense constant, nor can it be correlated with any structural difference, so that *P. albo-marginatum* can be safely relegated to synonymy.

5. POGONATUM NUDIUSCULUM Mitt. Plate 24, fig. 503.

Pogonatum nudiusculum MITT., Journ. Linn. Soc. Suppl. 2 Bot. (Musc. Ind. Or.) (1859) 153.

Slender, dull-brown, gregarious plants. Stems simple, to 2 cm high. Upper leaves crowded, strongly incurved and contorted when dry, erect-spreading when moist, gradually lanceolate from an indistinct lightly clasping base, short-pointed, to 8 mm long, coarsely spinose-serrate above and distantly toothed nearly to base of blade; costa sharply toothed on back above; lamellæ low, relatively few, covering about half width of blade on ventral face, in cross section 1 to 3 cells high, terminal cell oval, thick-walled; basal cells short-rectangular with incrassate yellowish walls, cells of blade irregularly rounded, incrassate. Seta 2 to 8 cm long, slender; capsule nearly erect, oblong-cylindric, urn to 3 mm long, lightly striate.

LUZON, Benguet Subprovince, Baguio, *Williams 1805*, *Robinson 14036*, *Merrill 4037*; Mount Tonglon, *Merrill 7333*.

Distribution: Sikkim, Bhotan.

On damp rocks in ravines. Well distinguished by the slender habit, strongly contorted leaves when dry, and especially by the relatively narrow median band of lamellæ covering only about half the width of the leaf blade.

6. POGONATUM GYMNOPHYLLUM Mitt. Plate 25, fig. 504.

Pogonatum gymnophyllum MITT., Journ. Linn. Soc. Suppl. 2 Bot. (Musc. Ind. Or.) (1859) 153.

Robust brownish plants. Stems simple, to 10 to 12 cm high, rarely to 20 cm, becoming naked below with age. Upper leaves crowded, flexuose when dry, erect-spreading when moist, gradually linear-lanceolate from a short-ovate base, sharply acute, carinate-concave, to 12 mm long; margins coarsely spinose-serrate nearly to base of blade, teeth tipped with a large, sharp, brownish cell; costa percurrent, spinose on back above; lamellæ 12 to 15, confined to ventral surface of costa, very short, only 1 or 2 cells high, terminal cell rounded in cross section; basal cells short-rectangular, cells of blade rounded, 16 to 20 μ in diameter, in one layer. Seta 2 to 2.5 cm long; capsule erect, urn 4 mm long; lid 1.5 mm long, conic-rostrate.

LUZON, Ifugao Subprovince, Mount Polis, *McGregor 20318*: Lepanto Subprovince, Mount Pangualaytacay, *Ramos and Edaño 40582*; Zambales Province, Mount Tapulao, summit, *Curran and Merritt 8176*. NEGROS, Canlaon Volcano, *Merrill 6822*.

Distribution: Himalayas, China, Tonkin, Formosa, Celebes.

Some of the above collections appear in the herbarium under the name of *P. Warburgii* Broth. and *P. Warburgii* C. M., but the name has never been published to my knowledge. Although thoroughly distinct from all of the local allies, I can find no reason for separating this plant from *P. gymnophyllum* Mitt. to which it seems to be connected by all the essential features.

7. POGONATUM MACROPHYLLUM (Doz. and Molk.) Bryol Jav. Plate 19, fig. 205.

Pogonatum macrophyllum (Doz. and Molk.) Bryol. Jav. 1 (1856) 46.

Very robust, dark-brown or blackish plants in lax colonies. Stems simple or with a few short branches near top, to 15 cm high or higher, slightly tomentose below. Lower leaves small, laxly erect, gradually larger upward, upper leaves curved and flexuose when dry, widely spreading when moist, gradually linear-lanceolate from a poorly defined, scarcely sheathing base, carinate-concave, sharply acute, 10 to 15 mm long or longer, coarsely spinose-serrate about halfway down; costa broad, percurrent, distantly toothed on back above; lamellæ rudimentary and practically none; cells of blade small, rounded, in 3 or 4 layers, basal cells short-rectangular. Seta 3 to 3.5 cm long; capsule erect or nearly so, often with several faint striæ.

LUZON, Benguet Subprovince, Mount Tonglon, *Merrill 7831*: Laguna Province, Mount Banahao, *Robinson 9799*, *Ocampo 28012*; Tayabas Province, Lucban, *Elmer 7901*. MINDORO, Mount Halcon, *Merrill 5761*. NEGROS, Oriental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 9769*, *Eskridge 17*. MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11420*: Bukidnon Province, Mount Lipa, *Ramos and Edaño 37163*: Zamboanga Province, *Copeland "B."*

Distribution: Malay Peninsula, Sumatra, Java, Moluccas, Celebes.

On deeply shaded banks. A splendid plant, not likely to be confused with any other species if the leaves are examined with ordinary care.

8. **POGONATUM TEYSMANNIANUM** (Doz. and Molk.) Bryol. Jav. Plate 19, fig. 506.

Pogonatum Teysmannianum (Doz. & Molk.) Bryol. Jav., Bryol. Jav. 1 (1855) 43.

Polytrichum Teysmannianum Doz. & Molk., Pl. Jungh. (1854) 323.

Rather slender plants, laxly tufted. Fertile stems to 6 cm high. Upper leaves incurved and contorted when dry, erect-spreading when moist, lingulate from a long hyaline base, bluntly pointed, concave above, to 7 mm long; margins distantly serrate more than halfway down blade; costa reddish brown, percurrent, with a few teeth on back near apex; lamellæ numerous, 2 or 3 cells high in cross section, end cell not differentiated; basal cells hyaline or slightly colored, rectangular, cells of blade transversely oval, incrassate. Seta 3.5 to 4.5 cm long; capsule inclined or horizontal, often indistinctly ribbed.

LUZON, Tayabas Province, Baler, *Santos 229, 242, 348*.

Distribution: Southern India, Ceylon, Sumatra, Java, Amboina, Borneo.

This species may be distinguished from *P. spurio-cirratum* by the broader leaf blade, the less strongly toothed margins, the low lamellæ, and the longer setæ.

9. **POGONATUM SPURIO-CIRRATUM** Broth. Plate 20, fig. 507.

Pogonatum spurio-cirratum BROTH., Philip. Journ. Sci. § C 5 (1910) 150.

Relatively slender, brownish, rigid plants in lax tufts. Stems 6 to 11 cm high, simple, rarely forked above. Lower leaves small, laxly erect, gradually larger upward, upper leaves crowded, strongly contorted with incurved points when dry, widely spreading when moist, gradually linear-lanceolate from an ovate, clasping base, carinate-concave, sharply acute, to 10 mm long, spinose-serrate nearly to base of blade; costa reddish brown, percurrent, remotely spinose on back above; lamellæ numerous, covering nearly all ventral face of blade, in cross section 3 to 5 cells high, end cell rounded; basal cells rectangular, yellowish, pellucid, shorter and incrassate at shoulders and toward margins, cells of blade small, rounded-quadrate, in one or two layers. Seta 2.5 to 3.5 cm long, slender, red; capsule suberect, urn 3 to 4 mm long; lid convex, with a short straight beak.

LUZON, numerous collections among which the following are representative: Benguet Subprovince, Mount Data, *Merrill 4908*; Mount Santo Tomas, *Williams 1808*, *Hadden 154*; Baguio, *Elmer 8605*; Pauai, *McGregor 8688*; Laguna Province, Mount Banahao, *Robinson 6502*, *Simbajon 2*.

Distribution: China.

Shaded, damp banks. Frequent in the mountains of Luzon but unrecorded from the other islands.

10. POGONATUM MICROSTOMUM (R. Br.) Brid. Plate 23, fig. 408.

Pogonatum microstomum (R. Br.) BRID., Bryol. Univ. 2 (1827) 746.
Polytrichum microstomum R. BR., Trans. Linn. Soc. 12: 569.

Robust, rigid, ruddy-brown plants in lax tufts. Stems simple or innovating, about 5 cm high, rarely to 10 cm, felted with pale tomentum below. Lower leaves small, scalelike, upper leaves rigid, appressed and slightly curved when dry, erect-spreading when moist, lanceolate from an ovate, yellowish, slightly sheathing base, sharply acute, to 8 mm long; margins strongly and sharply serrate nearly to base of blade; costa reddish brown, percurrent, strongly toothed on back above; lamellæ numerous, covering most of ventral face of blade, in cross section 4 or 5 cells high, end cell much larger and divided nearly to base into two equal forks; basal cells short-rectangular, transversely elongate near shoulders, upper cells small, rounded-quadrate. Setæ 2.5 to 3 cm long, red, frequently two from one perichætium; capsules inclined, reddish brown, papillose; lid broadly convex with a short, straight beak.

LUZON, Benguet Subprovince, Mount Data, *Merrill 4991*; Mount Santo Tomas, *Williams 1791*; Pauai, *Copeland 1338*, *Santos 32067*; Mount Pulog, *McGregor 8908*, *Curran, Merritt, and Zschokke 16411*.

Distribution: Himalayas, Khasia, Nilghiri, Ceylon, Western China.

On banks in mountain forests. Similar in appearance to *P. Wallisi* but more robust, with broader leaves and widely distinct in the cleft marginal cells of the lamellæ.

11. POGONATUM WALLISI (C. M.) Jaeg. Plate 23, fig. 409.

Pogonatum Wallisi (C. M.) JAEG., Adumbr. 1 (1873–1874) 722.
Polytrichum Wallisi C. M., Linnæa 37 (1872) 171.

Robust, woody plants, reddish brown, laxly tufted. Stems erect, rigid, to 10 cm high but usually shorter, simple or with one or two lateral innovations above. Lower leaves small, aristate-pointed, appressed, upper leaves narrowly lanceolate from a short, pale sheathing base, erect, rigid and very slightly curved when dry, widely spreading when moist, short-acuminate, 7 to 8 mm long, remotely and sharply serrate nearly to base of blade; costa excurrent in a short reddish point, toothed on back above; lamellæ numerous, in section 4 to 6 cells high, end cell round, yellowish and densely papillose; basal cells narrowly rectangular, pale, abruptly transversely oval and incrassate at shoulders, small, rounded and incrassate in blade. Seta slender, 2.5 to 4 cm long; capsule inclined or subhorizontal, urn 3 mm long and 1.5 mm wide, papillose; calyptra large, extending below base of capsule.

LUZON, Benguet Subprovince, *Ramos 5934*; Mount Data, *Hadden 157*; Baguio, *Elmer 8604*; Mount Santo Tomas, *Williams 1802*; Bontoc Subprovince, Mount Polis, *Ramos and Edaño 38238* in part, *McGregor 20317*.

Distribution: Borneo.

On open banks. Generally speaking the capsules of this species are more inclined than in *P. urnigerum*, but this seems to be the only distinguishing character. Occasional plants with suberect capsules are difficult to separate, and I imagine that eventually it may be necessary to treat *P. Wallisi* as a well-marked form of *P. urnigerum*.

45. Family DAWSONIACEÆ

Dioicous. Mostly very robust, rigid plants with the habit of *Polytrichum*. Stems erect from a rhizomatous base. Lower leaves scalelike, appressed; upper leaves crowded, rigidly erect-spreading, narrowly linear-lanceolate from a short, sheathing base, lamellate on ventral face. Seta terminal, solitary, short or elongate; capsule erect, ovoid, small mouthed; peristome a brushlike tuft of numerous pale, filiform, bristlelike teeth in many concentric rows, slightly spirally twisted; lid slender, subulate, erect; calyptra cucullate, more or less pilose; spores small.

180. Genus DAWSONIA R. Br.

Dawsonia R. BR., Trans. Linn. Soc. 10 (1811) 316.

Plants with the characters of the family.

DAWSONIA SUPERBA Grev. Plate 27, fig. 670.

Dawsonia superba GREV., Ann. & Mag. Nat. Hist. (1847) 226.

Stems to 50 or 60 cm high, rigid, woody, naked and triangular below, densely foliate above. Lower leaves small, membranous, closely appressed, mostly eroded; upper leaves crowded, rigid, narrowly linear-subulate from a short, clasping base, slightly flexuose when dry, to 3 cm long; margins spinose-serrate nearly halfway down the blade; costa short-excurrent; lamellæ numerous, covering nearly ventral face of blade, 4 to 7 cells high, marginal cells, both in section and when viewed from the side, slightly to considerably larger than cells below; basal cells narrowly linear, thin walled, yellowish, abruptly angular, dense and transversely elongate at shoulders, cells of blade minute, rounded-quadrate, incrassate. Seta stout, 2.5 cm long; capsule erect when young, becoming horizontal with age, 10 mm long, 6 mm wide.

MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 10680*: Occidental Misamis Province, Mount Malindang, *Mearns & Hutchinson 4788*: Bukidnon Province, Mount Lipa, *Ramos & Edaño 38503*.

Distribution: Australia, Tasmania, New Zealand.

I can find no distinctions between the Mindanao plants and *D. superba* from Australia and New Zealand. The lamellæ vary in height from 4 to 7 rows, and from the side show the marginal row of cells very variable on the same leaf, sometimes appreciably larger than the lower rows and again scarcely differentiated.

EXCLUDED SPECIES

HYPNUM PHILIPPINENSE Duby.

Hypnum philippinense DUBY, Mem. Soc. Phys. Geneve 26 (1879) 11, 176.

Rhynchostegium philippinense (Duby) JAEG., Adumbr. 2 (1877) 438.

I have not seen the original collection and cannot place the species with any satisfaction from the description and figures.

HYPNUM SUBPYCNOPHYLLUM C. M.

Hypnum subpycnophyllum C. M., Linnæa 38 (1874) 605.

Possible conspecific with *Warburgiella cupressinoides* C. M., but the material I have seen is too scanty to warrant a definite opinion. The leaves are slightly secund.

HYPNUM LLANOSII Duby.

Hypnum Llanosii DUBY, Mem. Soc. Phys. 26 (1879) 10.

Probably a synonym of *Stereophyllum anceps* (Bryol. Jav.) Broth. Note Theriot's remarks.[11]

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[11] Bull. Soc. Bot. Geneve 28 (1936) 86.

LITERATURE CITED [12]

BROTHERUS, V. F. Musci. Monsunia 1 (1900) 42–52, 175–177.

BROTHERUS, V. F. Contributions to the Bryological Flora of the Philippines, I. Oefversigt af Finska Vetenskaps-Societetens Foerhandlingar (14) 47 (1904–1905) 1–12; II, Philip. Journ. Sci. § C 3 (1908) 11–30; III, ibid. § C 5 (1910) 137–162; IV, ibid. § C 8 (1913) 65–98; V, ibid. § C 13 (1918) 201–223; VI, ibid. 31 (1926) 277–300.

BROTHERUS, V. F. Musci Halconenses. Philip. Journ. Sci. § C 2 (1907) 339–343.

BROTHERUS, V. F. Musci novi Philippinenses. Leafl. Philip. Bot. 2 (1909) 651–658; 6 (1913) 1973–1979.

MERRILL, E. D. An enumeration of Philippine flowering plants 4 (1926) 1–239.

MONTAGNE, C. Plantas cellulares quas in insulis Philippinensibus a cl. Cuming collectas recensuit observationibus non nullis descriptionibusque illustravit. Hook. Lond. Journ. Bot. 3 (1844) 658–662; 4 (1845) 3–11.

MÜLLER, C. M. Musci Indici novi adjectis nonnullis aliis exoticis. Linnaea 37 (1872) 163–182.

MÜLLER, C. M. Novitates Bryothecae Mullerianae, I. Musci Philippinenses praesertim Wallisiani adjectis nonnullis muscis aliis indices. Linnaea 38 (1874) 545–572.

ROBINSON, C. B. The geographic distribution of Philippine mosses. Philip. Journ. Sci. § C 9 (1914) 195–218.

SULLIVANT, W. S. Notices of some new mosses in the collection of the United States Exploring Expedition under Captain Wilkes. Proc. Am. Acad. Arts Sci. 3 (1855) 181–185.

SULLIVANT, W. S. Musci. United States Exploring Expedition under the command of Charles Wilkes U. S. N. (1) 17 (1859).

THERIOT, I. Reliquiae Boisserianae. Bull. Soc. Bot. Geneve 26 (1936) 76–91.

WARNSTORF, C. Die Sphagna der Philippinen. Philip. Journ. Sci. § C 7 (1912) 253–258.

WILLIAMS, R. S. Philippine mosses. Bull. N. Y. Bot. Gard. 8 (1914) 331–377.

WILLIAMS, R. S. Mosses of the Philippine and Hawaiian Islands collected by the late John B. Leiberg. Bull. Torr. Bot. Club 42 (1915) 571–577.

GLOSSARY

ACROCARPOUS. With the fruit terminal on stem or branch.

ACUMEN. A slender tapering point.

ACUMINATE. With an acumen.

ACUTE. With a short sharp point.

ALAR. Referring to the cells at the basal angle of the leaf.

AMPHIGASTRIA. The stipulelike leaves on the under or upper side of the stem as contrasted with the lateral leaves.

ANNULUS. The ring of specialized cells between the rim of the capsule and the lid.

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[12] Scattered references to Philippine mosses occur in numerous publications not listed here.

ANTHERIDIUM. The male reproductive organ.

APICULUS. A short abrupt point.

APOPHYSIS. A swelling of the seta just below the capsule.

APPENDICULATE. Referring to the short, transverse appendages of the cilia.

ARCHEGONIUM. The female reproductive organ.

ARCUATE. Curved like a bow.

AREOLATION. The cellular network of the leaf.

ARISTA. A fine, bristlelike point.

AURICLE. A small lobe at the basal angle of the leaf.

AUTOICOUS. Having the antheridia and archegonia in separate clusters on the same plant.

BEAK. The prolonged apex of the lid.

BIFID. Cleft into two parts.

BISTRATOSE. With the cells in two layers.

CÆSPITOSE. Tufted.

CALYPTRA. The membranous hood covering the lid of the capsule.

CAMPANULATE. Bell-shaped.

CANALICULATE. Channeled.

CANCELLINÆ. The sharply defined, large, hyaline basal cells in Calymperaceæ.

CAPSULE. The fruit or spore-bearing case of the sporophyte.

CARINATE. Keeled like a boat.

CERNUOUS. Somewhat drooping.

CHLOROPHYLLOSE. Containing chlorophyll grains.

CILIA. Fine threads or hairs, often applied to the structures alternating with the segments of the inner peristome.

CIRCINATE. Coiled inward from the apex.

CIRRATE. Curled.

COLUMELLA. The sterile central axis of the capsule.

COMOSE. Tufted at the tips, in a comal tuft.

COMPLANATE. Flattened in one plane.

COSTA. The nerve or midrib of the leaf.

CRENULATE. With fine, rounded teeth.

CRISPATE. Variously curled and twisted.

CUCULLATE. Like a hood.

CUSPIDATE. With a sharp, stiff point.

CYGNEOUS. Curved downward like a swan's neck.

CYMBIFORM. Shaped like a boat.

DECUMBENT. Prostrate with ascending tips.

DECURRENT. With the leaf edges extending down the stem below the insertion.

DENDROID. Like a tree.

DENTATE. With sharp, pointed teeth.

DENTICULATE. With minute or obscure teeth.

DIMORPHOUS. Of two forms.

DIOICOUS. With the antheridia and archegonia on separate plants.

DISCOID. Like a disc (male inflorescence).

DISTICHOUS. In two opposite rows.

DIVARICATE. Widely spreading.

DORSAL. Relating to the back; the surface or part of the leaf facing away from the stem.

ECOSTATE. Without a costa.

EMARGINATE. With an apical notch.

EMERGENT. With the rim of the capsule elevated slightly above the tips of the perichætial leaves.

ENDEMIC. Confined to a single country or area.

ENDOTHECIUM. The inner layers of cells of the sporogonium.

EROSE. Irregularly notched.

EXCAVATE. Hollowed out in a curve, applied to the leaf insertion.

EXCURRENT. With the costa extending beyond the leaf apex.

EXOTHECIAL. The outer cells of the capsule wall.

EXSERTED. With the base of the capsule elevated beyond the tips of the perichætial leaves.

FALCATE. Curved like a sickle.

FALCATE-SECUND. Falcate and curved to one side of the stem.

FASCICULATE. In short bunches, applied to branches.

FASTIGIATE. With erect branches of equal height.

FIBRILLOSE. With fine fibers, applied to the hyaline cells of *Sphagnum*.

FILIFORM. Like a thread.

FLABELLIFORM. Fan-shaped.

FLAGELLIFORM. Like the lash of a whip.

FLEXUOSE. Waved or bent alternately backward and forward.

FRONDOSE. Like a frond.

FUSIFORM. Spindle-shaped.

GEMMÆ. Small budlike bodies serving the purpose of vegetative reproduction.

GENICULATE. Bent like a knee.

GIBBOUS. Swollen on one side.

GLABROUS. Smooth.

GLAUCOUS. Overcast with a whitish bloom.

GYMNOSTOMOUS. Without a peristome.

HAMATE. Hooked.

HETEROECIOUS. With several forms of inflorescence in the same species.

HISPID. With short, stiff hairs.

HOMOMALLOUS. Applied to leaves all pointing in the same direction.

HYALINE. Colorless and transparent.

HYGROSCOPIC. Changing form and position by the absorbtion of water.

IMBRICATED. Overlapping, like shingles on a roof.

IMMERSED. With the rim of the capsule not elevated above the tips of the perichætial leaves.

INCRASSATE. Thickened, as of cell walls.

INFLORESCENCE. Clusters of reproductive organs.

INNOVATION. A young branch or shoot from the stem.

INSERTION. The line of attachment of the leaf with the stem.

INVOLUTE. Inwardly rolled.

JULACEOUS. Smoothly cylindrical, like a catkin.

LACINIATE. Cut or torn into narrow strips.

LAMELLÆ. Thin plates or sheets.

LAMINA. The leaf blade as distinguished from the costa.

LANCEOLATE. Shaped like a lance.

LID. The cap covering the mouth of the capsule.

LIGULATE. Strap-shaped.

LINGULATE. Tongue-shaped.

LUMEN. The cavity of a cell.

MAMMILLATE. Convex with a nipplelike tip.

MICRON. A thousandth of a millimeter, represented by the Greek letter μ.

MITRIFORM. Miter-shaped, symmetrical, cleft on all sides.

MUCRONATE. With a short, abrupt point or mucro, usually formed by the excurrent costa.

MUTICOUS. Not pointed.

NECK. The lower part of the capsule between the urn and the seta.

NODOSE. With knots or swellings.

OBCONIC. Inversely conic.

OBCORDATE. Inversely cordate.

OBOVATE. Inversely ovate, narrowed below.

OCHREA. Thin sheath surrounding the base of the seta.

OVATE. Egg-shaped, broader below.

PAPILLÆ. Minute protuberances of various forms.

PAPILLOSE. Covered with papillæ.

PARAPHYLLIA. Minute leaflike or branched organs scattered among the leaves.

PARAPHYSES. Jointed hyaline hairs associated with the reproductive organs.

PARENCHYMATOUS. Composed of broad cells joined end to end, not dovetailed.

PAROICOUS. Having the antheridia and archegonia in the same cluster but not mixed, the antheridia axillary below the archegonia.

PELLUCID. Translucent but not hyaline.

PENDULOUS. Loosely pendent or hanging.

PERCURRENT. Ending in the apex, applied to the costa.

PERICHAETIUM. The leaves surrounding the female flower.

PERIGONIUM. The leaves surrounding the male flower.

PERISTOME. The fringe of teeth surrounding the mouth of the capsule.

PILIFEROUS. With a long hairlike point.

PLANE. Flat.

PLEUROCARPOUS. With the fruit axillary and lateral on the stem or branch.

PLICATE. With longitudinal folds or plaits.

PLUMOSE. Like a plume, feathery.

POROSE. Perforated with small holes or pores.

PROCUMBENT. Trailing or prostrate.

PROPAGULA. Modified bodies effecting nonsexual reproduction.

PROSENCHYMATOUS. Composed of narrow cells with the ends dovetailed.

PSEUDOPODIUM. A false seta.

PUNCTATE. Dotted.

PYRIFORM. Shaped like a pear.

QUADRATE. Square.

RADICLES. Rootlets growing from the stem.

RADICULOSE. With radicles.

RETUSE. Obtuse and slightly indented.

REVOLUTE. Rolled backward, as of the leaf margin.

ROSTELLATE. With a short beak.

ROSTRATE. With a long beak.

ROSULATE. Like a rosette.

RUGOSE. Wrinkled.

RUPESTRINE. Growing on rocks.

SCABROUS. Rough.

SCARIOUS. Thin and dry, papery.

SECUND. Turned to one side.

SEGMENTS. The divisions of the inner peristome.

SERRATE. With sawlike teeth.

SERRULATE. Finely serrate.

SESSILE. Not stalked.

SETA. The stalk supporting the capsule.

SETACEOUS. Like a bristle.

SHEATHING. Partly clasping, as of the leaf base.

SINOUSE. Wavy.

SPATHULATE. Like a spatula, narrowly obovate, tapering downwards.

SPINULOSE. With small spines.

SPOROPHYTE. The spore-bearing organs, including all the parts produced by the fertilization of the archegonium.

SQUARROSE. Widely and abruptly spreading.

STOLONIFEROUS. With slender, creeping, microphyllous stems.

STOMATA. Openings in the capsule wall surrounded by special guard cells.

STRIATE. With fine longitudinal lines or ridges.

STRUMOSE. With a goiterlike swelling at the base of the capsule.

SUB-. A prefix denoting 'almost,' 'nearly,' or 'slightly.'

SUBULATE. With an awllike point or subula.

SULCATE. Longitudinally furrowed.

SYNOICOUS. Having the antheridia and archegonia mixed together in the same cluster.

TENIOLÆ. The intra-marginal border of differentiated cells in Calymperaceæ.

TERETE. Smoothly cylindrical.

TERRESTRIAL. Growing on earth.

TOMENTOSE. Covered with a thick felt of soft matted hairs or tomentum.

TRABECULATE. With prominent transverse ridges on the inner side of the peristome teeth.

TRUNCATE. Abruptly cut off at the apex.

TUBULOSE. Like a tube.

TUMID. Swollen or turgid.

TURBINATE. Shaped like a top.

UNISTRATOSE. With the cells in one layer.

URCEOLATE. Like an urn, contracted below the mouth.

VAGINULA. A small sheath representing part of the archegonium at the base of the seta.

VENTRAL. Relating to the front, the surface of the leaf facing the stem.

VENTRICOSE. Swollen on one side.

VERMICULAR. Curved like a worm.

VESICULOSE. Inflated like a bladder.

ILLUSTRATIONS

(The symbols used in the plates and their meanings are as follows: *a*, plant; a_1, part of plant; *b*, stem leaf; b_1, part of leaf; *c*, branch leaf; *d*, perichaetial leaf; d_1, apex of perichaetial leaf; *e*, upper leaf cells; *eb*, basal leaf cells; *f*, apex of branch leaf; *g*, capsule; *h*, part of peristome; *i*, calyptra; *j*, leaf or part of leaf in cross section; *k*, leaf base; *l*, lamellae; l_1, lamellae in cross section; *m*, comal leaf; *n*, propagula; n_1, detail of part of propagula; *o*, stipe leaf; *p*, perichaetium; *r*, basal angle of leaf (alar cells); *s*, part of seta; *t*, sporophyte; *u*, leaf shoulder; *v*, amphigastria; *y*, part of stem in cross section; *z*, apex of stem leaf.)

PLATE 1

FIG. 1. *Sphagnum japonicum* Warnst. var. *philippinense* Warnst. *b*, Stem leaf, × 10; *c*, branch leaf, × 10; *e*, upper leaf cells, × 200; *j*, part of leaf in cross section, × 200.

2. *Sphagnum cuspidatulum* C. M. var. *malaccense* Warnst. *a*, Part of plant, × 10; *b*, Stem leaf, × 10; *c*, branch leaf, × 10; *e*, upper leaf cells, × 200; *f*, apex of branch leaf, × 80; *j*, part of leaf in cross section, × 200.

3. *Sphagnum luzonense* Warnst. *b*, Stem leaf, × 10; *c*, branch leaf, × 10; *e*, upper leaf cells, dorsal, × 200; *f*, apex of branch leaf, × 40; *j*, part of leaf in cross section, × 200; *y*, part of stem in cross section, × 80.

4. *Sphagnum Robinsonii* Warnst. *b*, Stem leaf, × 10; *c*, branch leaf, × 10; *e*, upper leaf cells, × 200; *f*, apex of branch leaf, × 80; *j*, part of leaf in cross section, × 200; *y*, part of stem in cross section, × 80.

5. *Sphagnum sericeum* C. M. *b*, Stem leaf, × 10; *c*, branch leaves, × 10; *e*, upper leaf cells, × 200; *f*, apex of branch leaf, × 40; *j*, part of leaf in cross section, × 200.

6. *Sphagnum Junghuhnianum* Doz. & Molk. *b*, Stem leaf, × 10; *c*, branch leaf, × 10; *e*, upper leaf cells, × 200; *f*, apex of branch leaf, × 40; *j*, part of leaf in cross section, × 200.

7. *Fissidens Zollingeri* Mont. *a*, Plant, × 1; *b*, stem leaf, × 10; *e*, upper leaf cells, × 200; *g*, capsule, × 10; *z*, apex of stem leaf, × 40.

8. *Fissidens xiphioides* Fleisch. *b*, Stem leaf, × 10; *e*, upper leaf cells, × 200; *z*, apex of stem leaf, × 40.

9. *Fissidens Schmidii* C. M. *a*, Plant, × 1; *b*, stem leaf, × 10; *e*, upper leaf cells, × 200; *z*, apex of stem leaf, × 80.

10. *Fissidens Elmeri* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *e*, upper leaf cells, × 200; *z*, apex of stem leaf, × 200.

11. *Fissidens Hollianus* Doz. & Molk. *a*, Plant, × 1; *b*, stem leaf, × 10; b_1, part of leaf, × 40; *e*, upper leaf cells, × 200.

12. *Fissidens Braunii* (C. M.) Doz. & Molk. *a*, Plant, × 1; *b*, stem leaf, × 10; *g*, capsule, × 10; *z*, apex of stem leaf, × 200.

FIG. 13. *Fissidens sylvaticus* Griff. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, duplicate blade, × 200; *z*, apex of stem leaf, × 200.

14. *Fissidens Mittenii* Par. *a*, Plant, × 0.5; *b*, stem leaf, × 10; *c*, upper leaf cells, duplicate blade, × 200; *z*, apex of stem leaf, × 200.

15. *Fissidens Robinsonii* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, × 200; *z*, apex of stem leaf, × 40.

PLATE 2

FIG. 16. *Fissidens nobilis* Griff. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 200; *z*, apex of stem leaf, × 40.

17. *Fissidens nagasakinus* Besch. var. *luzonensis* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*. upper leaf cells, × 200; *z*, apex of stem leaf, × 40.

18. *Fissidens anomalus* Mont. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 200; *z*, apex of stem leaf, × 40.

19. *Fissidens pulogensis* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, × 200.

20. *Fissidens splachnobryoides* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, × 80; *z*, apex of stem leaf, × 40.

21. *Fissidens rizalensis* sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, × 200; *z*, apex of stem leaf, × 40.

22. *Fissidens diversiretis* sp. nov. *a*. Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, × 200; *z*, apex of stem leaf, × 80.

23. *Garckea phascoides* (Hook.) C. M. *a*. Plant, × 1; a_1, part of plant, × 6; *b*, stem leaf, × 6.

24. *Ditrichum flexifolium* (Hook.) Hampe. *a*, Plant, × 1; *b*, stem leaf, × 6; *g*, capsule, × 6; *h*, part of peristome, × 40.

25. *Ceratodon stenocarpus* C. M. *a*, Plant, × 1; *b*, stem leaf, × 6; *c*, upper leaf cells. × 230; *g*, capsule, × 6.

26. *Trematodon longicollis* Michx. *a*, Plant, × 1; *b*, stem leaf, × 6; *g*, capsule, × 4.

27. *Wilsoniella pellucida* (Wils.) C. M. *a*, Plant, × 1; stem leaf, × 10; *h*, part of peristome, × 40; *z*, apex of stem leaf, × 60.

28. *Aongstroemia orientalis* Mitt. *a*, Plant, × 1; *b*, stem leaves, × 12; *c*, upper leaf cells, × 230; *z*, apex of stem leaf, × 40.

29. *Dicranella coarctata* (C. M.) Bryol. Jav. *a*, Plant, × 1; *b*, stem leaf, × 8; *h*, part of peristome, × 80.

30. *Dicranella Leibergii* Williams. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 230.

31. *Dicranella brasiliensis* (Duby) Bartram. *a*, Plant, × 1; *b*, stem leaf, × 8; *g*, capsule, × 8; *h*, part of peristome, × 80.

PLATE 3

FIG. 32. *Dicranella insularis* Williams. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 230; *g*, capsule, × 8.

33. *Dicranella setifera* (Mitt.) Jaeg. *a*, Plant, × 1; *b*, stem leaf, × 6; *g*, capsule, × 4.

FIG. 34. *Campylopodium euphorocladum* (C. M.) Besch. *a*, Plant, × 1; *b*, stem leaf, × 8; *g*, capsule, × 8.

35. *Campylopus acutiramens* Dix. & Ther. *a*, Plant, × 1; *b*, stem leaf, × 8; *j*, part of costa in cross section, × 230; *z*, apex of stem leaf, × 20.

36. *Campylopus PesFunariae* (C. M.) Par. *b*, Stem leaf, × 6; *j*, part of costa in cross section, × 230; *k*, leaf base, × 50.

37. *Campylopus caudatus* (C. M.) Mont. *a*, Plant, × 1; *b*, stem leaf, × 6; *g*, capsule, × 6; *j*, part of costa in cross section, × 230.

38. *Campylopus ericoides* (Griff.) Jaeg. *a*, Plant, × 1; *b*, stem leaf, × 6; *i*, calyptra, × 8.

39. *Campylopus calodictyon* Broth. *g*, Capsule, × 8; *k*, leaf base, × 50.

40. *Campylopus subericoides* Williams. *b*, Stem leaf, × 6; *g*, capsule, × 8; *z*, apex of stem leaf, × 50.

41. *Campylopus hemitrichius* (C. M.) Jaeg. *b*, Stem leaf, × 9; *j*, part of costa in cross section, × 230; *k*, leaf base, × 50; *z*, apex of stem leaf, × 30.

42. *Campylopus diversinervis* Broth. *b*, Stem leaf, × 4; *j*, part of costa in cross section, × 230; *k*, leaf base, × 50; *z*, apex of stem leaf, × 20

43. *Campylopus eurydictyon* Dix. *j*, Part of costa in cross section, × 230; *k*, leaf base, × 50; *z*, apex of stem leaf, × 60.

44. *Campylopus porrectatus* Ther. *b*, Stem leaf, × 8; *j*, part of costa in cross section, × 80; *k*, leaf base, × 60.

45. *Campylopus umbellatus* (W. Arn.) Bartram. *a*, Plant, × 1; *b*, stem leaf, × 6; *g*, capsule, × 6; *j*, part of leaf in cross section, × 80.

46. *Campylopus exasperatus* Brid. *a*, Plant, × 1; *b*, stem leaf, × 6; *m*, comal leaf, × 6; *z*, apex of stem leaf, × 40.

47. *Dicranodontium nitidum* (Doz. & Molk.) Fleisch. *a*, Plant, × 1; *b*, stem leaf, × 5; *e*, upper leaf cells, × 230.

48. *Dicranodontium uncinatum* (Harv.) Jaeg. *k*, Leaf base, × 40; *z*, apex of stem leaf, × 40.

PLATE 4

FIG. 49. *Dicranodontium subasperum* Williams. *a*, Plant, × 1; *k*, leaf base, × 40; *z*, apex of stem leaf, × 80.

50. *Brothera Leana* (Sull.) C. M. *a*, Plant, × 1; *b*, stem leaf, × 9; *j*, part of costa in cross section, × 230; *z*, apex of stem leaf, × 230.

51. *Amphidium papillosum* Bartram sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 9; *e*, upper leaf cells, × 230; *j*, part of leaf in cross section, × 230.

52. *Rhabdoweisiella papillosa* Williams. *a*, Plant, × 8; *b*, stem leaf, × 18; *e*, upper leaf cells, × 150.

53. *Symblepharis Reinwardtii* (Doz. & Molk.) Bry. Jav. *a*, Plant, × 1; *b*, stem leaf, × 3; *e*, upper leaf cells, × 230.

54. *Holomitrium vaginatum* (Hook.) Brid. *a*, Plant, × 1; *b*, stem leaf, × 9; *p*, perichætium, × 6.

FIG. 55. *Dicranoloma assimile* (Hampe) Par. *b*, Stem leaf, × 6; *c*, upper leaf cells, × 230.

56. *Dicranoloma Philippinae* Bartram sp. nov. *b*, Stem leaf, × 4; *c*, upper leaf cells, × 230; *g*, capsule, × 6.

57. *Dicranoloma perarmatum* Broth. *b*, Stem leaf, × 6; *c*, upper leaf cells, × 230; *e*, apex of stem leaf, × 40.

58. *Dicranoloma Blumii* (Nees) Par. *b*, Stem leaf, × 3; *c*, upper leaf cells, × 230; *g*, capsule, × 6.

59. *Dicranoloma fragile* (Hook.) Broth. *a*, Plant, × 1; b_1, part of leaf; *b*, stem leaf, × 6; *c*, upper leaf cells, × 230.

60. *Dicranoloma reflexifolium* (C. M.) Par. *b*, Stem leaf, × 4; *c*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

61. *Dicranoloma reflexum* (C. M.) Broth. *c*, Upper leaf cells, × 230; *k*, leaf base, × 40.

62. *Dicranoloma Braunii* (C. M.) Par. *b*, Stem leaf, × 4; *c*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40; *n*, propagula, × 40.

PLATE 5

FIG. 63. *Dicranoloma leucophyllum* (Hampe) Par. *a*, Plant, × 1; *b*, stem leaf, × 3; *f*, apex of branch leaf, × 40.

64. *Leucoloma molle* (C. M.) Mitt. b_1, Part of leaf, × 40; *b*, stem leaf, × 6.

65. *Leucoloma perviride* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *c*, upper leaf cells, × 50; *f*, apex of branch leaf, × 80.

66. *Braunfelsia dicranoides* (Doz. & Molk.) Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *c*, upper leaf cells, × 230.

67. *Schistomitrium subrobustum* Broth. *b*, Stem leaf, × 6; *k*, leaf base margin, × 80.

68. *Schistomitrium apiculatum* Doz. & Molk. *b*, Stem leaf, × 6; *g*, capsule, × 6; *i*, calyptra, × 6; *e*, apex of stem leaf, × 40.

69. *Schistomitrium Nieuwenhuisi* Fleisch. *b*, Stem leaf, × 6; *g*, capsule, × 6; *s*, part of seta, × 40; *e*, apex of stem leaf, × 40.

70. *Cladopodanthus speciosus* (Doz. & Molk.) Fleisch. *a*, Plant, × 1; *b*, stem leaf, × 10; *i*, calyptra, × 10.

71. *Cladopodanthus muticus* Broth. *b*, Stem leaf, × 10; *e*, apices of stem leaf, × 40.

72. *Leucobryum sanctum* Hampe. *b*, Stem leaf, × 4; *g*, capsule, × 6; *k*, leaf base, × 40.

73. *Leucobryum subsanctum* Broth. *g*, Capsule, × 6; *j*, part of leaf in cross section, × 80; *e*, apex of stem leaf, × 40.

74. *Leucobryum Bowringii* Mitt. *b*, Stem leaf, × 4; *c*, upper leaf cells, × 230; *j*, part of leaf in cross section, × 40.

75. *Leucobryum neilgherrense* C. M. *b*, Stem leaf, × 5; *c*, upper leaf cells, × 230; *j*, part of leaf in cross section, × 40.

76. *Leucobryum javense* (Brid.) Mitt. *c*, Stem leaf, × 3; *f*, apex of branch leaf, × 40.

77. *Leucobryum scalare* C. M. *b*, Branch leaf, × 6; *c*, upper leaf cells, × 80; *f*, apex of branch leaf, × 40.

78. *Leucobryum pentastichum* Doz. & Molk. a_1, Part of plant; *c*, branch leaf, × 6; *g*, capsule, × 6.

FIG. 79. *Leucophanes candidum* (Hornsch.) Lindb. c, Branch leaf, × 6; f, apex of branch leaf, × 40; g, capsule, × 6; j, part of leaf in cross section, × 80.

80. *Leucophanes albescens* C. M. c, Branch leaf, × 6; e, upper leaf cells, × 230; f, apex of branch leaf, × 40.

PLATE 6

FIG. 81. *Leucophanes octoblepharioides* Brid. c, Branch leaf, × 6; f, apex of branch leaf, × 40; k, leaf base, × 40.

82. *Octoblepharum albidum* Hedw. a, Plant, × 1; b, stem leaf, × 6; j, leaf in cross section, × 40.

83. *Arthrocormus Schimperi* Doz. & Molk. a, Plant, × 1; b, stem leaf, × 6; j, leaf in cross section, × 80.

84. *Exodictyon Sullivantii* (Doz. & Molk.) Fleisch. a, Plant, × 1; b, stem leaf, × 20; u, leaf shoulder, × 80; z, apex of stem leaf, × 80.

85. *Exodictyon Blumii* (C. M.) Fleisch. a, Plant, × 1; b, stem leaf, × 12; j, leaf in cross section, × 80; z, apex of stem leaf, × 80.

86. *Syrrhopodon revolutus* Doz. & Molk. a, Plant, × 1; b, stem leaf, × 20; f, apex of branch leaf, × 80.

87. *Syrrhopodon borneensis* (Hampe) Jaeg. e, Upper leaf cells, × 230; f, apex of branch leaf, × 80.

88. *Syrrhopodon rufescens* Hook. & Grev. a, Plant, × 1; b, stem leaf, × 20; f, apex of branch leaf, × 80.

89. *Syrrhopodon amoenus* Broth. a, Plant, × 1; b, stem leaf, × 20; e, upper leaf cells, × 230; f, apex of branch leaf, × 80.

90. *Syrrhopodon tristichus* Nees. a, Part of plant, × 1; c, branch leaf, × 4; f, apex of branch leaf, × 230.

91. *Syrrhopodon albovaginatus* Schwaegr. a, Plant, × 1; c, branch leaf, × 10; f, apex of branch leaf, × 60.

92. *Syrrhopodon flammeo-nervis* C. M. a, Plant, × 0.5; c, branch leaf, × 6; e, upper leaf cells, × 230; f, apex of branch leaf, × 80.

93. *Syrrhopodon Bartletti* Bartram sp. nov. a, Plant, × 1; b, stem leaf, × 10; e, upper leaf cells, × 230; w, propagula, × 80; z, apex of stem leaf, × 80.

94. *Syrrhopodon Semperi* C. M. a, Plant, × 1; b, stem leaf, × 15; e, upper leaf cells, × 230; z, apex of stem leaf, × 80.

95. *Syrrhopodon spiculosus* Hook. & Grev. a, Plant, × 1; b, stem leaf, × 15; e, upper leaf cells, × 220; z, apex of stem leaf, × 80.

96. *Syrrhopodon philippinensis* Bartram sp. nov. b, Stem leaf, × 15; u, leaf shoulder, × 80; z, apex of stem leaf, × 80.

97. *Syrrhopodon ciliatus* (Hook.) Schwaegr. b, Stem leaf, × 20; e, upper leaf cells, × 80.

98. *Syrrhopodon subulatus* Lac. a, Plant, × 1; e, upper leaf cells, × 230; k, leaf base, × 40; z, apex of stem leaf, × 15.

99. *Syrrhopodon fallax* Lac. e, Upper leaf cells, × 230; z, apex of stem leaf, × 40.

PLATE 7

FIG. 100. *Syrrhopodon Mulleri* (Doz. & Molk.) Lac. *a*, Plant, × 1; *b*, stem leaf, × 3; *c*, upper leaf cells, × 230.

101. *Syrrhopodon croceus* Mitt. *a*, Plant, × 0.5; *b*, stem leaf, × 3; *u*, leaf shoulder, × 40; *z*, apex of stem leaf, × 40.

102. *Syrrhopodon Gardneri* (Hook.) Schwaegr. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 230; *u*, leaf shoulder, × 230.

103. *Thyridium constrictum* (Sull.) Mitt. *a*, Plant, × 1; *b*, stem leaf, × 12.

104. *Thyridium Wallisi* (C. M.) Fleisch. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 230; *z*, apex of stem leaf, × 80.

105. *Thyridium undulatum* (Doz. & Molk.) Fleisch. *b*, Stem leaf, × 7; *c*, upper leaf cells, × 230; *z*, apex of stem leaf, × 80.

106. *Thyridium flavum* (C. M.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 10; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

107. *Calymperes Dozyanum* Mitt. *a*, Plant, × 1; *b*, stem leaves, × 12.

108. *Calymperes tenerum* C. M. *b*, Stem leaf, × 10; *k*, leaf base, × 40.

109. *Calymperes Clemensiae* Broth. *b*, Stem leaf, × 7; *i*, calyptra, × 8; *z*, apex of stem leaf, × 40.

110. *Calymperes hyophylaceum* C. M. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 230; *k*, leaf base, × 40.

111. *Calymperes Semperi* Hampe. *b*, Stem leaf, × 12; *u*, leaf shoulder, × 80.

112. *Calymperes tuberculosum* (Dix. & Ther.) Broth. *b*, Stem leaf, × 8; b_1, part of leaf, × 80; *z*, apex of stem leaf, × 40.

113. *Calymperes moluccense* Schwaegr. *b*, Stem leaf, × 12; *u*, leaf shoulder, × 230.

114. *Calymperes Ramosii* Broth. *b*, Stem leaf, × 11; *c*, upper leaf cells, × 230; *m*, comal leaf, × 7.

115. *Calymperes salakense* Besch. *b*, Stem leaf, × 9; *z*, apex of stem leaf, × 40.

116. *Calymperes tahitense* (Sull.) Mitt. *b*, Stem leaf, × 6; *f*, apex of branch leaf, × 40; *u*, leaf shoulder, × 230.

PLATE 8

FIG. 117. *Calymperes datense* Bartram sp. nov. *b*, Stem leaf, × 5; *k*, leaf base, × 230; *z*, apex of stem leaf, × 40.

118. *Calymperes serratum* A. Br. *a*, Plant, × 1; *b*, stem leaf, × 5; *c*, upper leaf cells, × 230; *z*, apex of stem leaf, × 40.

119. *Pachyneuron Bartlettii* Bartram sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 6; *j*, part of leaf in cross section, × 230; *z*, apex of stem leaf, × 40.

120. *Anoectangium euchloron* (Schwaegr.) Mitt. *a*, Plant, × 1; *b*, stem leaf, × 30; *c*, upper leaf cells, × 230; *z*, apex of stem leaf, × 80.

121. *Anoectangium subclarum* Broth. *b*, Stem leaf, × 30; *c*, upper leaf cells, × 230; *z*, apex of stem leaf, × 80.

FIG. 122. *Merceyopsis minuta* Broth. & Dix. var. *subminuta* (Broth.) Broth. & Dix. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

123. *Merceya Baconii* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *e*, upper leaf cells, × 230; *z*, apex of stem leaf, × 80.

124. *Hymenostomum edentulum* (Mitt.) Besch. *a*, Plant, × 1; *b*, stem leaf, × 12; *g*, capsule, × 12.

125. *Weisia controversa* Hedw. *g*, Capsule, × 12; *h*, part of peristome, × 80; *z*, apex of stem leaf, × 80.

126. *Hymenostylium recurvirostrum* (Hedw.) Dix. *c*, Branch leaf, × 10; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80; *g*, capsule, × 6.

127. *Hymenostylium inconspicuum* Griff. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *k*, leaf base, × 16.

128. *Hymenostyliella involuta* (Card. & Thér.) Bartram comb. nov. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40; *j*, part of leaf in cross section, × 230.

129. *Rhamphidium Dixoni* Bartram sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 12; *g*, capsule, × 6; *h*, part of peristome, × 80.

130. *Trichostomum cuspidatum* Doz. & Molk. *b*, Stem leaf, × 8; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

131. *Trichostomum angustatum* (Mitt.) Fleisch. *b*, Stem leaf, × 4; *f*, apex of branch leaf, × 40; *u*, leaf shoulder, × 230.

132. *Trichostomum subduriusculum* (C. M.) Broth. *c*, Branch leaf, × 12; *f*, apex of branch leaf, × 40; *g*, capsule, × 7.

133. *Pseudosymblepharis perevaginata* (Broth.) Broth. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

134. *Timmiella Merrillii* Broth. *c*, Branch leaf, × 7; *f*, apex of branch leaf, × 80; *j*, part of leaf in cross section, × 230.

PLATE 9

FIG. 135. *Hyophila involuta* (Hook.) Jaeg. *b*, Stem leaf, × 7; *e*, upper leaf cells, × 230; *z*, apex of stem leaf, × 40.

136. *Hyophila rosea* Williams. *b*, Stem leaf, × 7; *e*, upper leaf cells, × 230; *g*, capsule, × 7; *z*, apex of stem leaf, × 40.

137. *Didymodon luzonensis* Bartram sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 12; *eb*, basal leaf cells, × 230; *h*, part of peristome, × 40; *z*, apex of stem leaf, × 80.

138. *Barbula subulata* Broth. *b*, Stem leaf, × 12; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230; *z*, apex of stem leaf, × 80.

139. *Barbula constricta* Mitt. *c*, Stem leaf, × 12; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230; *f*, apex of branch leaf, × 80.

140. *Barbula indica* (Schwaegr.) Brid. *b*, Stem leaf, × 12; *g*, capsule, × 7; *h*, part of peristome, × 80; *z*, apex of stem leaf, × 30.

141. *Barbula obscuriretis* Dix. *c*, Branch leaf, × 12; *f*, apex of branch leaf, × 40; *g*, capsule, × 7.

142. *Barbula consanguinea* (Thw. & Mitt.) Jaeg. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

FIG. 143. *Barbula javanica* Doz. & Molk. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

144. *Barbula lobaguetensis* Williams. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

145. *Barbula pseudo-Ehrenbergii* Fleisch. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

146. *Barbula pilifera* (Hook.) Brid. *c*, Branch leaf, × 10.

147. *Funaria luzonensis* Broth. *a*, Plant, × 1; *b*, stem leaf, × 12; *g*, capsule, × 6; *z*, apex of stem leaf, × 6.

148. *Funaria calvescens* Schwaegr. *b*, Stem leaf, × 6; *g*, capsule, × 5.

149. *Gymnostomiella vernicosa* (Hook.) Fleisch. *b*, Stem leaf, × 40; *c*, upper leaf cells, × 230; *n*, propagula, × 80.

150. *Gymnostomiella longinervis* Broth. *b*, Stem leaf, × 40; *c*, upper leaf cells, × 230; *ch*, basal leaf cells, × 230.

151. *Splachnobryum indicum* Hampe & C. M. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 230.

PLATE 10

FIG. 152. *Splachnobryum latifolium* Bartram sp. nov. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 230.

153. *Splachnobryum luzonense* Broth. *a*, Plant, × 1; *b*, stem leaf, × 15; *g*, capsule, × 12; *h*, part of peristome, × 230.

154. *Tayloria indica* Mitt. *b*, Stem leaf, × 12; *i*, calyptra, × 7.

155. *Tayloria subglabra* (Griff.) Mitt. *g*, Capsule, × 6; *i*, calyptra, × 7.

156. *Webera elongata* (Hedw.) Schwaegr. *b*, Stem leaf, × 8; *g*, capsule, × 3; *h*, part of peristome, × 40.

157. *Webera Hampeana* Lac. *c*, Upper leaf cells, × 230; *g*, capsule, × 3; *z*, apex of stem leaf, × 40.

158. *Webera scabridens* (Mitt.) Jaeg. *a*, Plant, × 0.5; *b*, stem leaf, × 7; *g*, capsule, × 7.

159. *Webera nutans* Hedw. *a*, Plant, × 1; *c*, upper leaf cells, × 230; *m*, comal leaf, × 10.

160. *Webera luzonensis* (Williams) Broth. *b*, Stem leaf, × 10; *h*, part of peristome, × 40; *z*, apex of stem leaf, × 40.

161. *Pseudopohlia bulbifera* Williams. *a*, Plant, × 0.6; *h*, part of peristome, ventral, × 60; *z*, apex of stem leaf, × 40.

162. *Brachymenium acuminatum* Harv. *a*, Plant, × 1; *b*, stem leaf, × 20; *c*, upper leaf cells, × 230.

163. *Brachymenium exile* (Doz. & Molk.) Bryol. Jav. *b*, Stem leaf, × 20; *c*, upper leaf cells, × 230; *g*, capsule, × 8.

164. *Brachymenium coarctatum* (C. M.) Bryol. Jav. *b*, Stem leaf, × 20; *g*, capsule, × 8; *h*, part of peristome, × 40.

165. *Brachymenium nepalense* Hook. *b*, Stem leaf, × 8; *c*, upper leaf cells, × 80.

166. *Anomobryum cymbifolium* (Lindb.) Broth. *b*, Stem leaf, × 20; *c*, upper leaf cells, × 230.

167. *Anomobryum gemmigerum* Broth. *b*, Stem leaf, × 20; *n*, propagula, × 80.

FIG. 168. *Bryum cellulare* Hook. *a*, Plant, × 1; *b*, stem leaf, × 12; *e*, upper leaf cells, × 230.

169. *Bryum abditum* Williams. *b*, Stem leaf, × 12; *g*, capsule, × 6; *z*, apex of stem leaf, × 80.

PLATE 11

FIG. 170. *Bryum argenteum* Hedw. *b*, Stem leaf, × 20; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

171. *Bryum microtheca* C. M. *g*, Capsule, × 8; *h*, part of peristome, × 40.

172. *Bryum coronatum* Schwaegr. *b*, Stem leaf, × 8; *g*, capsule, × 8.

173. *Bryum chrysobasilare* Broth. *a*, Plant, × 1; *b*, stem leaf, × 10; *f*, apex of stem leaf, × 40.

174. *Bryum ambiguum* Duby. *b*, Stem leaf, × 10; *e*, upper leaf cells, × 230; *g*, capsule, × 6.

175. *Bryum capillare* Hedw. *b*, Stem leaf, × 10; *e*, upper leaf cells, × 230.

176. *Bryum ramosum* (Hook.) Mitt. *b*, Stem leaf, × 5; *z*, apex of stem leaf, × 40.

177. *Rhodobryum giganteum* (Hook.) Schimp. *a*, Plant, × 0.25; *b*, stem leaf, × 2.

178. *Rhodobryum Curranii* Broth. *b*, Stem leaf, × 6; *e*, upper leaf cells, × 230.

179. *Orthomnium Loheri* Broth. *a*, Plant, × 1; *b*, stem leaf, × 3; *e*, upper leaf cells, × 230; *g*, capsule, × 3.

180. *Orthomnium stolonaceum* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *e*, upper leaf cells, × 80.

181. *Mnium rostratum* Schwaegr. *a*, Plant, × 0.5; *z*, apex of stem leaf, × 15.

182. *Mnium integrum* Bryol. Jav. *b*, Stem leaf, × 8; *e*, upper leaf cells, × 80.

183. *Mniomalia semilimbata* (Mitt.) C. M. *b*, Stem leaf, × 16; *e*, upper leaf cells, × 230.

184. *Hymenodon sericeus* (Doz. & Molk.) C. M. *a*, Plant, × 1; *c*, branch leaf, × 15; *e*, upper leaf cells, × 230.

185. *Hymenodon angustifolius* Lac. *c*, Branch leaf, × 15; *e*, upper leaf cells, × 230; *g*, capsule, × 7.

186. *Rhizogonium spiniforme* (Hedw.) Bruch. *a*, Plant, × 0.5; *c*, branch leaf, × 5; c_1, detail of margin of branch leaf, × 80.

187. *Rhizogonium longiflorum* (Mitt.) Jaeg. *c*, Branch leaf, × 5; *d*, perichætial leaf, × 7; *f*, apex of branch leaf, × 80.

PLATE 12

FIG. 188. *Hypnodendron Reinwardtii* (Hornsch.) Lindb. *c*, Branch leaf, × 8; *f*, apex of branch leaf, × 40; *g*, capsule, × 2.

189. *Hypnodendron arborescens* (Mitt.) Lindb. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230.

190. *Hypnodendron vitiense* Mitt. *c*, Branch leaf, × 8; *f*, apex of branch leaf, × 40; *o*, stipe leaf, × 8

FIG. 191. *Hypnodendron Copelandii* Broth. *a*, Part of plant, × 6; *c*, branch leaves, × 12.
192. *Mniodendron Korthalsii* Bryol. Jav. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230.
193. *Mniodendron divaricatum* (Hornsch. & Reinw.) Lindb. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.
194. *Mniodendron fusco-mucronatum* (C. M.) Broth. *a*, Part of plant, × 6; *c*, branch leaf, × 12.
195. *Leiomela javanica* (Ren. & Card.) Broth. *b*, Stem leaf, × 8; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.
196. *Philonotis Roylei* (Hook. f.) Mitt. *a*, Plant, × 1; *c*, branch leaf, × 20; *g*, capsule, × 7.
197. *Philonotis tjibodensis* (Fleisch.) Broth. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230; *h*, part of peristome, × 60.
198. *Philonotis imbricatula* Mitt. *a*, Plant, × 1; *c*, branch leaf, × 20; *f*, apex of branch leaf, × 80; *g*, capsule, dry, × 6.
199. *Philonotis laxissima* (C. M.) Bryol. Jav. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.
200. *Philonotis secunda* (Doz. & Molk.) Bryol. Jav. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.
201. *Philonotis revoluta* Bryol. Jav. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230.
202. *Philonotis mollis* (Doz. & Molk.) Bryol. Jav. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230.
203. *Philonotis speciosa* (Griff.) Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.
204. *Philonotis falcata* (Hook.) Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 20.
205. *Fleischerobryum macrophyllum* Broth. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *g*, capsule, × 2.
206. *Breutelia Merrillii* Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 8; *k*, leaf base, × 80.
207. *Breutelia arundinifolia* (Duby) Fleisch. *c*, Branch leaf, × 5; *k*, leaf base, × 60.

PLATE 13

FIG. 208. *Spiridens Reinwardtii* Nees. *c*, Branch leaf, × 2; *e*, upper leaf cells, × 80.
209. *Aulacopilum luzonense* Bartram sp. nov. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.
210. *Orthotrichum Meyenianum* Hampe. *b*, Stem leaves, × 10; *g*, capsule, × 10.
211. *Macromitrium orthostichum* Nees. *a*, Plant, × 1; *b*, stem leaf, × 12; *g*, capsule, dry, × 6; *i*, calyptra, × 6.
212. *Macromitrium Reinwardtii* Schwaegr. *a*, Plant, × 1; *c*, branch leaf, × 15; *g*, capsule, dry, × 6; *i*, calyptra, × 6.
213. *Macromitrium fasciculare* Mitt. *c*, Branch leaf, × 15; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.
214. *Macromitrium benguetense* Williams. *a*, Plant, × 1; *c*, branch leaf, × 8; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

FIG. 215. *Macromitrium falcatulum* C. M. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

216. *Macromitrium nepalense* (Hook. & Grev.) Schwaegr. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230; *g*, capsule, × 6.

217. *Macromitrium Blumii* Nees. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

218. *Macromitrium Robinsonii* Williams. *c*, Branch leaf, × 12; *g*, capsule, × 12; *i*, calyptra, × 12.

219. *Macromitrium Foxworthyi* Broth. *c*, Branch leaf, × 12; *g*, capsule, × 8.

220. *Macromitrium subuligerum* Bryol. Jav. *c*, Branch leaf, × 12; *eb*, basal leaf cells, × 230; *f*, apex of branch leaf, × 80.

221. *Macromitrium semipellucidum* Doz. & Molk. *f*, Apex of branch leaf, × 60; *h*, part of peristome, × 50.

222. *Macromitrium angustifolium* Doz. & Molk. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *i*, calyptra, × 6.

223. *Macromitrium salakanum* C. M. *a*, Plant, × 1; *d*, perichætial leaf, × 12.

224. *Macromitrium cuspidatum* Hampe. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

225. *Macromitrium mindorense* Broth. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *g*, capsule, × 6.

226. *Macromitrium ochraceum* (Doz. & Molk.) C. M. *c*, Branch leaf, × 8; *g*, capsule, rim, × 6; *i*, calyptra, × 12.

PLATE 14

FIG. 227. *Macromitrium sulcatum* (Hook.) Brid. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

228. *Macromitrium goniostomum* Broth. *e*, Upper leaf cells, × 230; *i*, calyptra, × 6.

229. *Macromitrium goniorhynchum* (Doz. & Molk.) Mitt. *c*, Branch leaf, × 12; *g*, capsule, × 6; *h*, leaf base, × 80.

230. *Schlotheimia Grevilleana* Mitt. *c*, Branch leaf, × 12; *i*, calyptra, × 6.

231. *Schlotheimia Wallisii* C. M. *c*, Branch leaf, × 6; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

232. *Desmotheca apiculata* (Doz. & Molk.) Lindb. *a*, Plant, × 1; *b*, stem leaves, × 12.

233. *Rhacopilum Schmidii* (C. M.) Jaeg. *a*, Part of plant, × 6; *f*, apex of branch leaf, × 40.

234. *Rhacopilum spectabile* Reinw. & Hornsch. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *g*, capsule, × 3.

235. *Acrocryphaea concavifolia* (Griff.) Bryol. Jav. *c*, Branch leaf, × 12; *d*, perichætial leaf, × 12; *e*, upper leaf cells, × 230.

236. *Pilotrichopsis dentata* (Mitt.) Besch. *c*, Branch leaf, × 12; *f*, apex of branch leaf, × 40; *r*, basal angle of leaf, alar cells, × 230.

237. *Bescherellea philippinensis* Broth. *c*, Branch leaf, × 6; *e*, upper leaf cells, × 230; *g*, capsule, × 6; *h*, part of peristome, × 40.

FIG. 238. *Hampeella leptodictyon* Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 24; *e*, upper leaf cells, × 230.

239. *Glyptothecium sciuroides* (Hook.) Hampe. *c*, Branch leaf, × 12; *g*, capsule, × 6.

240. *Trachypus humilis* Lindb. *a*, Part of plant, × 1; *c*, branch leaf, × 24; *e*, upper leaf cells, × 230.

241. *Trachypus bicolor* Reinw. & Hornsch. *c*, Branch leaf, × 10; *f*, apex of branch leaf, × 50; *g*, capsule, × 6.

242. *Pseudospiridentopsis horrida* (Mitt.) Fleisch. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

243. *Trachypodopsis crispatula* (Hook.) Fleisch. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

PLATE 15

FIG. 244. *Duthiella complanata* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 3.

245. *Myurium rufescens* (Reinw. & Hornsch.) Fleisch. *c*, Branch leaf, × 10; *f*, apex of branch leaf, × 40; *g*, capsule, × 6.

246. *Myurium Foxworthyi* (Broth.) Broth. *c*, Branch leaf, × 5; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

247. *Pilotrichum pseudorufescens* (Hampe) C. M. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

248. *Pterobryella longifrons* (C. M.) C. M. *c*, Branch leaf, × 6; *f*, apex of branch leaf, × 40; *g*, capsule, × 3.

249. *Trachyloma indicum* Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 6; *n*, propagula, × 40.

250. *Endotrichella Elmeri* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *e*, upper leaf cells, × 230.

251. *Endotrichella elegans* (Doz. & Molk.) Fleisch. *b*, Stem leaf, × 6; *i*, calyptra, × 15; *k*, sporophyte, × 6; *z*, apex of stem leaf, × 15.

252. *Endotrichella pilifera* Broth. *z*, Apex of stem leaf, × 15.

253. *Endotrichella serricuspes* Broth. *b*, Stem leaf, × 6; *z*, apex of stem leaf, × 15.

254. *Endotrichella perplicata* Broth. *b*, Stem leaf, × 6; *z*, apex of stem leaf, × 16.

255. *Garovaglia punctidens* Williams. *a*, Plant, × 0.6; *b*, stem leaf, × 6; *e*, upper leaf cells, × 230.

256. *Garovaglia plicata* (Nees) Endl. *b*, Stem leaf, × 6; *e*, upper leaf cells, × 230.

257. *Garovaglia luzonensis* Williams. *a*, Plant, × 0.6; *b*, stem leaf, × 6; *d*, perichætial leaf, × 6.

258. *Euptychium philippinense* Dix. *b*, Stem leaf, × 6; *d*, perichætial leaf, × 6; *e*, upper leaf cells, × 230; *i*, calyptra, × 6.

259. *Neolindbergia rugosa* (Mont.) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 10; *e*, upper leaf cells, × 230.

260. *Jaegerina luzonensis* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *e*, upper leaf cells, × 230.

PLATE 16

FIG. 261. *Jaegerina Williamsii* Bartram nom. nov. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *e*, upper leaf cells, × 230; *g*, capsule, × 6.

FIG. 262. *Pterobryopsis crassicaulis* (C. M.) Fleisch. *a*, Plant, × 0.5; *b*, stem leaf, × 6.

263. *Pterobryopsis gedehensis* Fleisch. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *e*, upper leaf cells, × 230.

264. *Symphysodon neckeroides* Doz. & Molk. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *e*, upper leaf cells, × 230.

265. *Symphysodon subneckeroides* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *t*, sporophyte, × 6.

266. *Symphysodontella subulata* Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

267. *Symphysodontella attenuatula* Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

268. *Symphysodontella cylindracea* (Mont.) Fleisch. *c*, Branch leaf, × 12, *e*, upper leaf cells, × 230; *t*, sporophyte, × 4.

269. *Papillaria fuscescens* (Hook.) Jaeg. *c*, Branch leaf, × 12. *e*, upper leaf cells, × 230; *h*, leaf base, × 40.

270. *Papillaria crocea* (Hampe) Jaeg. *c*, Stem leaf, × 12; *e*, upper leaf cells, × 230.

271. *Meteorium Miquelianum* (C. M.) Fleisch. *c*, Branch leaf, × 12. *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

272. *Meteorium helminthocladum* (C. M.) Fleisch. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

273. *Aerobryopsis longissima* (Doz. & Molk.) Fleisch. *c*, Branch leaf, × 8; *e*, upper leaf cells, × 230.

274. *Aerobryopsis philippinensis* Bartram sp. nov. *a*, Part of plant, × 0.5; *c*, branch leaf, × 8; *e*, upper leaf cells, × 230.

275. *Aerobryopsis scariosa* Bartram sp. nov. *a*, Part of plant, × 0.5; *c*, branch leaf, × 8.

276. *Floribundaria floribunda* (Doz. & Molk.) Fleisch. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230

277. *Floribundaria pseudo-floribunda* Fleisch. *b*, Stem leaf, × 12; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

278. *Floribundaria thuidioides* Fleisch. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12; *f*, apex of branch leaf, × 40

PLATE 17

FIG. 279. *Barbella comes* (Griff.) Broth. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

280. *Barbella rufifolioides* (Broth.) Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

281. *Barbella Clemensiae* Broth. *b*, Stem leaf, × 12; *c*, branch leaf, × 12; *f*, apex of branch leaf, × 40.

282. *Barbella anceroblasta* Broth. *b*, Stem leaf, × 12; *e*, upper leaf cells, × 230.

283. *Barbella enervis* (Mitt.) Fleisch. *a*, Part of plant, × 0.5; *b*, stem leaf, × 12.

284. *Barbella horridula* Broth. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12.

285. *Barbella pendula* (Sull.) Fleisch. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12; *p*, capsule, × 6.

FIG. 286. *Meteoriopsis reclinata* (Mitt.) Fleisch. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12.

287. *Meteoriopsis squarrosa* (Hook.) Fleisch. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

288. *Aerobryum speciosum* Doz. & Molk. *b*, Stem leaf, × 8; *e*, upper leaf cells, × 230.

289. *Orthorrhynchidium phyllogonioides* (Sull.) E. G. Britt. *a*, Part of plant, × 1; *b*, stem leaf, × 12; *e*, upper leaf cells, × 230.

290. *Calyptothecium crispulum* (Lac.) Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 12.

291. *Calyptothecium luzonense* (Williams) Bartram comb. nov. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

292. *Calyptothecium Urvilleanum* (C. M.) Broth. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12.

293. *Calyptothecium MacGregorii* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

294. *Calyptothecium Ramosii* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

PLATE 18

FIG. 295. *Calyptothecium caudatum* Bartram sp. nov. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *f*, apex of branch leaf, × 40.

296. *Calyptothecium himantocladioides* Bartram sp. nov. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

297. *Neckeropsis Lepineana* (Mont.) Fleisch. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

298. *Neckeropsis gracilenta* (Lac.) Fleisch. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12.

299. *Neckeropsis crinita* (Griff.) Fleisch. *a*, Part of plant, × 0.5; *i*, sporophyte, × 8.

300. *Himantocladium plumula* (Nees) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 8; *f*, apex of branch leaf, × 40.

301. *Himantocladium cyclophyllum* (C. M.) Fleisch. *a*, Plant, × 0.5; *i*, sporophyte, × 8.

302. *Himantocladium loriforme* (Bryol. Jav.) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

303. *Himantocladium scrobiculatum* (Nees) Bartram comb. nov. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

304. *Homaliodendron exiguum* (Bryol. Jav.) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

305. *Homaliodendron microdendron* (Mont.) Fleisch. *a*, Plant, × 0.5; *b*, stem leaf, × 12; *c*, branch leaf, × 12.

306. *Homaliodendron flabellatum* (Smith) Fleisch. *b*, Stem leaf, × 12; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

307. *Pinnatella anacamptolepis* (C. M.) Broth. *a*, Plant, × 1; *b*, stem leaf, × 12; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

308. *Pinnatella microptera* (C. M.) Fleisch. *a*, Plant, × 1; *b*, stem leaf, × 12; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

FIG. 309. *Pinnatella ambigua* (Bryol. Jav.) Fleisch. *a*, Plant, × 1; *b*, stem leaf, × 12; *c*, branch leaf, × 12; *f*, apex of branch leaf, × 40.

310. *Pinnatella nana* (Williams) Bartram comb. nov. *a*, Plant, × 1; *c*, branch leaves, × 12; *e*, upper leaf cells, × 230.

311. *Pinnatella alopecuroides* (Hook.) Fleisch. *c*, Branch leaf, × 12; *v*, leaf shoulder, × 100.

312. *Pinnatella luzonensis* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

313. *Thamnium ellipticum* (Bryol. Jav.) Lindb. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

PLATE 19

FIG. 314. *Thamnium negrosense* Bartram sp. nov. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230.

315. *Thamnium latifolium* (Bryol. Jav.) Par. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

316. *Thamnium subseriatum* (Hook.) Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

317. *Elmeriobryum philippinense* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *r*, basal angle of leaf, alar cells, × 100.

318. *Porotrichodendron mahahaicum* (C. M.) Fleisch. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

319. *Daltonia contorta* C. M. *a*, Plant, dry, × 1; *b*, stem leaf, × 12; *g*, capsule, × 8; *i*, calyptra, × 8.

320. *Daltonia angustifolia* Doz. & Molk. *a*, Plant, × 1; *b*, stem leaf, × 12; *e*, upper leaf cells, × 230; *g*, apex of stem leaf, × 40.

321. *Leskeodon philippinensis* Broth. *a*, Part of plant, × 1; *b*, stem leaf, × 12; *g*, capsule, × 8; *h*, part of peristome, × 40.

322. *Distichophyllum cuspidatum* Doz. & Molk. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 230.

323. *Distichophyllum nigricaule* Mitt. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 100.

324. *Distichophyllum subnigricaule* Broth. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 100.

325. *Distichophyllum Santosii* Bartram sp. nov. *b*, Stem leaf, × 12; *c*, upper leaf cells, × 40; *g*, capsule, × 8.

326. *Distichophyllum Osterwaldii* Fleisch. *b*, Stem leaf, × 8; *h*, part of peristome, × 50.

327. *Distichophyllum tortile* Bryol. Jav. *b*, Stem leaf, × 8; *c*, upper leaf cells, × 80.

328. *Distichophyllum Mittenii* Bryol. Jav. *a*, Plant, × 0.5; *b*, stem leaf, × 8; *c*, upper leaf cells, × 80.

329. *Eriopus parviretis* Fleisch. *b*, Stem leaf, × 8; *c*, upper leaf cells, × 80; *g*, capsule, × 8.

330. *Eriopus remotifolius* C. M. *a*, Plant, × 0.5; *b*, stem leaf, × 8; *c*, upper leaf cells, × 230.

331. *Eriopus flaccidus* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 8; *g*, apex of stem leaf, × 50.

332. *Cyclodictyon Blumeanum* (C. M.) Broth. *c*, Branch leaf, × 12; *f*, apex of branch leaf, × 50.

PLATE 20

FIG. 333. *Callicostella papillata* (Mont.) Mitt. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 50.

334. *Callicostella prabaktiana* (C. M.) Bryol. Jav. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

335. *Hookeriopsis geminidens* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 80.

336. *Actinodontium rhaphidostegum* (C. M.) Bryol. Jav. *c*, Branch leaf, × 12; *h*, part of peristome, × 50.

337. *Chaetomitrium lanceolatum* Bryol. Jav. *c*, Branch leaf, × 20; *g*, capsule, × 6; *i*, calyptra, × 6.

338. *Chaetomitrium Elmeri* Broth. *c*, Branch leaves, × 20; *e*, part of seta, × 60.

339. *Chaetomitrium perarmatum* Broth. *c*, Branch leaf, × 20; *g*, capsule, × 8; *i*, calyptra, × 8.

340. *Chaetomitrium Weberi* Broth. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

341. *Chaetomitrium orthorrhynchum* (Doz. & Molk.) Bryol. Jav. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 80; *i*, calyptra, × 8.

342. *Chaetomitrium papillifolium* Bryol. Jav. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 80; *g*, capsule, × 8.

343. *Chaetomitrium seriatum* Broth. *a*, Part of plant, × 4; *c*, branch leaf, × 20.

344. *Chaetomitrium philippinense* (Mont.) Bryol. Jav. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230.

345. *Chaetomitrium laevifolium* Dix. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 40; *g*, capsule, × 6.

346. *Chaetomitrium Warburgii* Broth. *c*, Branch leaf, × 20; *df*, apex of perichaetial leaf, × 80.

347. *Chaetomitrium pseudo-elongatum* Broth. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 80.

348. *Chaetomitriopsis glaucocarpa* (Reinw.) Fleisch. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8; *i*, calyptra, × 8.

349. *Symphyodon Merrillii* Broth. *c*, Branch leaf, × 15; *e*, upper leaf cells, × 230; *g*, capsule, × 6.

350. *Symphyodon Copelandii* Broth. *a*, Plant, × 1; *b*, stem leaf, × 15; *d*, perichaetial leaf, × 15.

351. *Leucomium aneurodictyon* (C. M.) Jaeg. *c*, Branch leaf, × 20; *g*, capsule, × 8.

PLATE 21

FIG. 352. *Hypopterygium javanicum* (Hampe) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20.

353. *Hypopterygium trichocladon* Bryol. Jav. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

354. *Hypopterygium Vriesii* Bryol. Jav. *a*, Part of plant, × 6.

355. *Hypopterygium ceylanicum* Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

FIG. 356. *Hypopterygium delicatulum* Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

357. *Cyathophorella spinosa* (C. M.) Fleisch. *b*, Stem leaf, × 6; *v*, amphigastria, × 6.

358. *Cyathophorella adiantum* (Griff.) Fleisch. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *v*, amphigastria, × 6.

359. *Cyathophorella aristifolia* Bartram sp. nov. *a*, Plant, × 0.5; *b*, stem leaf, × 10; *v*, amphigastria, × 10.

360. *Cyathophorella Hookeriana* (Griff.) Fleisch. *a*, Plant × 0.5; *b*, stem leaf, × 10; *v*, amphigastria, × 10.

361. *Fabronia curvirostris* Doz. & Molk. *c*, Branch leaf, × 40; *e*, upper leaf cells, × 230; *g*, capsule, × 12; *h*, part of peristome, × 100.

362. *Merrilliobryum fabronioides* Broth. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

363. *MacGregorella philippinensis* Bartram sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 40; *e*, upper leaf cells, × 230; *g*, capsule, × 8; *h*, part of peristome, × 80.

364. *Pseudoleskeopsis decurvata* (Mitt.) Broth. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

365. *Claopodium nervosum* (Harv.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

366. *Pelekium velatum* Mitt. *a*, Part of plant, × 40; *g*, capsule, × 6.

367. *Pelekium bifarium* (Bryol. Jav.) Fleisch. *a*, Part of plant, × 6; *e*, upper leaf cells, × 230.

368. *Thuidium tamariscellum* (C. M.) Bryol. Jav. *b*, Stem leaf, × 40; *c*, branch leaf, × 40; *g*, capsule, × 6.

PLATE 22

FIG. 369. *Thuidium investe* (Mitt.) Jaeg. *a*, Plant, × 1; a_1, part of plant, × 40; *g*, capsule, × 6.

370. *Thuidium benguetense* Broth. *a*, Plant, × 1; *b*, stem leaf, × 40; *c*, branch leaf, × 40; *e*, upper leaf cells, × 230.

371. *Thuidium kiasense* Williams. *a*, Plant, × 1; *c*, branch leaf, × 40; *e*, upper leaf cells, × 230; *i*, calyptra, × 12.

372. *Thuidium Meyenianum* (Hampe) Bryol Jav. *a*, Plant, × 1; *c*, branch leaf, × 40; *g*, capsule, × 6.

373. *Thuidium plumulosum* (Doz. & Molk.) Bryol. Jav. *a*, Plant, × 0.5; *c*, branch leaf, × 40; *f*, apex of branch leaf, × 230.

374. *Thuidium glaucinum* (Mitt.) Jaeg. *b*, Stem leaf, × 20; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

375. *Thuidium glaucinoides* Broth. *b*, Stem leaf, × 20; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

376. *Thuidium cymbifolium* (Doz. & Molk.) Bryol. Jav. *b*, Stem leaf, × 12; *d*, perichaetial leaf, × 10.

377. *Homalothecium appressifolium* (Williams) Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

FIG. 378. *Pleuropus luzonensis* Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 13; *e*, upper leaf cells, × 230; *eb*, basal leaf cells, × 230.

379. *Brachythecium Buchanani* (Hook.) Jaeg. *a*, Plant, × 0.5; *b*, stem leaf, × 8; *c*, branch leaf, × 8.

380. *Brachythecium plumosum* (Hedw.) Br. & Schp. *b*, Stem leaf, × 8; *c*, branch leaf, × 8; *e*, upper leaf cells, × 230; *g*, capsule, × 6.

381. *Eurhynchium Mulleri* (Bryol. Jav.) Bartram. *b*, Stem leaf, × 12; *g*, capsule, × 8; *i*, calyptra, × 8.

382. *Eurhynchium asperisetum* (C. M.) Bartram comb. nov. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *f*, apex of branch leaf, × 40.

383. *Eurhynchium vagans* (Harv.) Bartr. *b*, Stem leaf, × 20; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

384. *Eurhynchium celebicum* (Bryol. Jav.) Bartram. *a*, Plant, × 0.5; *c*, branch leaf, × 15.

385. *Rhynchostegiella menadensis* (Bryol. Jav.) Bartram comb. nov. *c*, Branch leaf, × 15; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

PLATE 23

FIG. 386. *Rhynchostegiella mindorensis* (Broth.) Broth. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

387. *Rhynchostegiella Edanoi* Broth. *a*, Plant, × 1; *c*, branch leaf, × 12; *g*, capsule, × 6.

388. *Erythrodontium julaceum* (Hook.) Par. *a*, Plant, × 1; *c*, branch leaf, × 20.

389. *Trachyphyllum inflexum* (Harv.) Gepp. *a*, Plant, dry, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

390. *Campylodontium flavescens* (Hook.) Bryol. Jav. *a*, Plant, × 1; *c*, branch leaf, × 12.

391. *Entodon ramulosus* Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

392. *Entodon rubicundus* (Wils.) Jaeg. *a*, Plant, × 0.5; *b*, stem leaf, × 12; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

393. *Entodon bandongiae* (C. M.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *k*, leaf base, × 40.

394. *Entodon plicatus* C. M. *g*, Capsule, × 6; *h*, part of peristome, × 40.

395. *Plagiotheciopsis philippinensis* Broth. *c*, Branch leaf, × 12; *g*, capsule, × 8; *h*, part of peristome, × 40.

396. *Stereophyllum anceps* (Bryol. Jav.) Broth. *a*, Plant, × 1; *c*, branch leaf, × 8; *g*, capsule, × 8.

397. *Plagiothecium neckeroideum* Br. & Schp. a_1, Part of plant; *c*, branch leaf, × 8; *f*, apex of branch leaf, × 40.

398. *Aptychella robusta* (Broth.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 12; *n*, propagula, × 12; n_1, detail of part of propagula, × 230.

399. *Clastobryella cucullifera* (Lac.) Fleisch. a_1, Part of plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

FIG. 400. *Clastobryella Merrillii* (Broth.) Fleisch. *e*, Branch leaf, × 12; *f*, apex of branch leaf, × 80; *k*, leaf base, × 80; *n*, propagula, × 12; *m*, detail of part of propagula, × 230.

401. *Mastopoma uncinifolium* (Broth.) Card. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

402. *Mastopoma Robinsonii* (Broth.) Bartram comb. nov. *c*, Branch leaf, × 12; *f*, apex of branch leaf, × 80; *g*, capsule, × 8.

PLATE 24

FIG. 403. *Acanthocladium benguetense* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 12; *c*, branch leaf, × 12.

404. *Trismegistia panduriformis* (C. H. Wright) Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

405. *Trismegistia calderensis* (Sull.) Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

406. *Trismegistia rigida* (Hornsch. & Reinw.) Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

407. *Trismegistia lancifolia* (Harv.) Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230.

408. *Meiothecium hamatum* (C. M.) Broth. *c*, Branch leaf, × 12; *f*, apices of branch leaf, × 80.

409. *Meiothecium attenuatum* Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *g*, capsule, × 8; *h*, part of peristome, × 40.

410. *Meiothecium bogoriense* Fleisch. *a*, Part of plant, × 1; *c*, branch leaves, × 12; *e*, upper leaf cells, × 230.

411. *Meiothecium microcarpum* (Harv.) Mitt. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *k*, leaf base, × 80.

412. *Chionostomum rostratum* (Griff.) C. M. *a*, Plant, × 1; *c*, branch leaf, × 12; *g*, capsule, × 6.

413. *Brotherella luzonensis* (Broth.) Fleisch. *c*, Branch leaf, × 12; *g*, capsule, × 6; exothecial cells, × 80.

414. *Warburgiella cupressinoides* C. M. *c*, Branch leaf, × 12; *g*, capsule, × 6; *i*, calyptra, × 8.

415. *Warburgiella philippinensis* (Williams) Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

416. *Sematophyllum tristiculum* (Mitt.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

417. *Sematophyllum luzonense* (Broth.) Broth. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

418. *Sematophyllum saproxylophilum* (C. M.) Fleisch. *c*, Branch leaf, × 12; *g*, capsule, × 8; *k*, leaf base, × 80.

419. *Sematophyllum microcladioides* Broth. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

PLATE 25

FIG. 420. *Rhaphidostichum piliferum* (Broth.) Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 6.

421. *Rhaphidostichum luzonense* (Broth.) Broth. *c*, Branch leaf, × 6; *e*, upper leaf cells, × 230; *g*, capsule, × 6.

FIG. 422. *Acroporium diminutum* (Brid.) Fleisch. *a*, Part of plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

423. *Acroporium lamprophyllum* Mitt. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

424. *Acroporium rufum* (Reinw. & Hornsch.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 12.

425. *Acroporium secundum* (Reinw. & Hornsch.) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

426. *Acroporium alto-pungens* (C. M.) Broth. *c*, Branch leaf, × 12; *g*, capsule, × 8.

427. *Acroporium sigmatodontium* (C. M.) Fleisch. *a*, Part of plant, × 0.5; *c*, branch leaf, × 12; *r*, basal angle of leaf, alar cells, × 40.

428. *Acroporium hermaphroditum* (C. M.) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

429. *Acroporium condensatum* (C. M.) Bartram comb. nov. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

430. *Acroporium homalulum* Fleisch. *c*, Branch leaf, × 12; *f*, apices of branch leaf, × 40.

431. *Acroporium stramineum* (Reinw. & Hornsch.) Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *g*, capsule, × 8.

432. *Acroporium falcifolium* Fleisch. *a*, Plant, × 0.5; *c*, branch leaf, × 12.

433. *Acroporium brevipes* (Broth.) Broth. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *h*, part of peristome, × 80.

434. *Trichosteleum elegantissimum* Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 12.

435. *Trichosteleum hamatum* (Doz. & Molk.) Jaeg. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 12.

436. *Trichosteleum brevisetum* Broth. *c*, Branch leaf, × 12; *f*, apex of branch leaf, × 80; *g*, capsule, × 8.

437. *Trichosteleum bistrumosum* (C. M.) Jaeg. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

PLATE 26

FIG. 438. *Trichosteleum complanatulum* (Dix.) Bartram comb. nov. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 12.

439. *Trichosteleum mindanense* Broth. *c*, Branch leaf, × 12; *d*, perichætial leaf, × 12; *e*, upper leaf cells, × 230; *g*, capsule, × 12.

440. *Trichosteleum Boschii* Doz. & Molk. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.

441. *Acanthorrhynchium papillatum* (Harv.) Fleisch. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8; *r*, basal angle of leaf, alar cells, × 80.

442. *Taxithelium Merrillii* Broth. *c*, Branch leaf, × 30; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

443. *Taxithelium instratum* (Brid.) Broth. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *r*, basal angle of leaf, alar cells, × 80.

FIG. 444. *Taxithelium batanense* Bartram sp. nov. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

445. *Taxithelium nepalense* (Schwaegr.) Broth. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 40; *i*, basal angle of leaf, alar cells, × 80.

446. *Taxithelium Gottscheanum* (Hampe) Broth. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

447. *Taxithelium spurio-subtile* Broth. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

448. *Taxithelium alare* Broth. *a*, Plant, × 1; *c*, branch leaf, × 20; *g*, capsule, × 8.

449. *Taxithelium Robinsonii* Broth. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230: *f*, apex of branch leaf, × 80.

450. *Taxithelium Lindbergii* (Bryol. Jav.) Ren. & Card. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

451. *Taxithelium ramicola* Broth. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

452. *Taxithelium Kerianum* (Broth.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 20; *g*, capsule, × 8.

453. *Taxithelium Bakeri* Broth. *c*, Branch leaves, × 20; *e*, upper leaf cells, × 230.

454. *Glossadelphus micro-similans* (Dix.) Bartram comb. nov. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

455. *Glossadelphus Zollingeri* (C. M.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 40; *e*, upper leaf cells, × 230.

456. *Macrohymenium strictum* Bryol. Jav. *a*, Plant, × 1; *c*, branch leaf, × 20; *h*, part of peristome, × 40.

457. *Stereodontopsis flagellifera* Williams. *a*, Plant, × 0.5; *c*, branch leaf, × 20.

PLATE 27

FIG. 458. *Ectropothecium ichnotocladum* (C. M.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20; *f*, apex of branch leaf, × 40.

459. *Ectropothecium perminutum* Broth. *a*, Plant, × 0.5: *c*, branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.

460. *Ectropothecium falciforme* (Doz. & Molk.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20; *f*, apex of branch leaf, × 40.

461. *Ectropothecium luzoniae* (C. M.) Jaeg. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.

462. *Ectropothecium buitenzorgii* (Bel.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20; *f*, apex of branch leaf, × 40: *g*, capsule, × 8.

463. *Ectropothecium ferrugineum* (C. M.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

464. *Ectropothecium eleganti-pinnatum* (C. M.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

465. *Ectropothecium striatulum* Dix. *a*, Plant, × 0.5; *b*, stem leaf, × 12; *c*, branch leaf, × 12.

466. *Ectropothecium dealbatum* (Hornsch. & Reinw.) Jaeg. *a*, Plant, × 0.5; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.

FIG. 467. *Ectropothecium monumentorum* (Duby) Jaeg. *a*, Plant, × 0.6; *c*, branch leaf, × 20; *g*, capsule, × 12.
468. *Trachythecium verrucosum* (Hampe) Fleisch. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 40; *g*, capsule, × 8.
469. *Trachythecium micropyxis* (Broth.) Bartram comb. nov. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *g*, capsule, × 8.
470. *Ectropotheciella distichophylla* (Hampe) Fleisch. *c*, Branch leaves, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.
471. *Isopterygium Textori* (Lac.) Mitt. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.
472. *Isopterygium minutirameum* (C. M.) Jaeg. *a*, Plant, × 1; *c*, branch leaf, × 20; *e*, upper leaf cells, × 230.
473. *Isopterygium pendulum* Dix. *a*, Plant, × 1; *c*, branch leaves, × 20; *e*, upper leaf cells, × 230.
474. *Isopterygium albescens* (Schwaegr.) Jaeg. *c*, Branch leaf, × 20; *f*, apex of branch leaf, × 80; *g*, capsule, × 8.
475. *Isopterygium bancanum* (Bryol. Jav.) Jaeg. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 80.

PLATE 28

FIG. 476. *Isopterygium saxense* Williams. *a*, Plant, × 1; *c*, branch leaf, × 20; *g*, capsule, × 8.
477. *Taxiphyllum taxirameum* Mitt. *a*, Plant, × 0.5; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230.
478. *Vesicularia Miquelii* (Bryol. Jav.) Fleisch. *c*, Branch leaf, × 12; *d*, perichaetial leaf, × 12; *e*, upper leaf cells, × 230.
479. *Vesicularia reticulata* (Doz. & Molk.) Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.
480. *Vesicularia Montagnei* (Bel.) Fleisch. *a*, Plant, × 1; *c*, branch leaf, × 12; *e*, upper leaf cells, × 230
481. *Vesicularia Dubyana* (C. M.) Broth. *c*, Branch leaf, × 12; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.
482. *Ctenidium mindanense* Williams. *c*, Branch leaf, × 20; *e*, upper leaf cells, × 230; *f*, apex of branch leaf, × 40.
483. *Ctenidium lychnites* (Mitt.) Broth. *a*, Plant, × 1; *b*, stem leaf, × 24; *c*, branch leaf, × 24; *f*, apex of branch leaf, × 60.
484. *Ctenidium luzonense* Broth. *b*, Stem leaf, × 20; *c*, branch leaf, × 20; *g*, capsule, × 6.
485. *Gollania benguetense* Broth. *a*, Plant, × 1; *c*, branch leaf, × 12; *f*, apex of branch leaf, × 40.
486. *Foreauella orthothecia* (Schwaegr.) Dix. & Varde. *a*, Plant, × 1; *c*, branch leaf, × 20.
487. *Leptohymenium tenue* (Hook.) Schwaegr. *b*, Stem leaf, × 12; *c*, branch leaf, × 12; *g*, capsule, × 6.
488. *Macrothamnium macrocarpum* (Reinw. & Hornsch.) Fleisch. *b*, Stem leaf, × 12; *c*, branch leaf, × 12; *g*, capsule, × 8.
489. *Macrothamnium javense* Fleisch. *b*, Stem leaf, × 12; *f*, apex of branch leaf, × 40.
490. *Buxbaumia javanica* C. M. *a*, Plants, × 1.5.

FIG. 491. *Diphyscium involutum* Mitt. *a*, Plant, × 1; *b*, stem leaf, × 6; *d*, perichætial leaf, × 6; *g*, capsule, × 6.

492. *Diphyscium rupestre* Doz. & Molk. *b*, Stem leaf, × 6; *c*, upper leaf cells, × 230; *j*, apex of branch leaf, × 40.

493. *Atrichum undulatum* (Hedw.) P. Beauv. *a*, Plant, × 1; *b*, stem leaf, × 4; *j*, part of leaf in cross section, × 80; *z*, apex of stem leaf, × 40.

494. *Atrichum flavisetum* Mitt. *b*, Stem leaf, × 6; *c*, upper leaf cells, × 230; *j*, part of leaf in cross section, × 80.

PLATE 29

FIG. 495. *Pseudoracelopus philippinensis* Broth. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 230.

496. *Pseudoracelopus mindanaensis* Bartram sp. nov. *a*, Plant, × 1; *b*, stem leaf, × 8; *d*, perichætial leaf, × 8; *c*, upper leaf cells, × 80.

497. *Racelopus pilifer* Doz. & Molk. *a*, Plant, × 1; *b*, stem leaf, × 8; *c*, upper leaf cells, × 80; *g*, capsule, × 6.

498. *Oligotrichum aligerum* Mitt. *a*, Plant, × 1; *b*, stem leaf, × 12; *i*, calyptra, × 6; *j*, part of leaf in cross section, × 40.

499. *Pogonatum spinulosum* Mitt. *a*, Plant, × 1; *b*, stem leaves, × 6; *d*, perichætial leaf, × 4.

500. *Pogonatum obtusum* (C. M.) Jaeg. *a*, Plant, × 1; *b*, stem leaf, × 6; *z*, apex of stem leaf, × 40.

501. *Pogonatum microphyllum* (Doz. & Molk.) Bryol. Jav. *b*, Stem leaf, × 6; *l*, lamellæ, × 200; *ls*, lamellæ in cross section, × 200; *z*, apex of stem leaf, × 40

502. *Pogonatum Junghuhnianum* (Doz. & Molk.) Bryol. Jav. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *ls*, lamellæ in cross section, × 200; *z*, apex of stem leaf, × 40.

503. *Pogonatum nudiusculum* Mitt. *a*, Plant, × 0.5; *b*, stem leaf, × 4; *z*, apex of stem leaf, × 40.

504. *Pogonatum gymnophyllum* Mitt. *b*, Stem leaf, × 3; *ls*, lamellæ in cross section, × 200; *z*, apex of stem leaf, × 40.

505. *Pogonatum macrophyllum* (Doz. & Molk.) Bryol. Jav. *b*, Stem leaf, × 2; *j_1*, part of leaf in cross section, × 200; *j*, leaf in cross section, × 40.

506. *Pogonatum Teysmannianum* (Doz. & Molk.) Bryol. Jav. *a*, Plant, × 0.5; *b*, stem leaf, × 6; *ls*, lamellæ in cross section, × 200.

507. *Pogonatum spurio-cirratum* Broth. *a*, Plant, × 0.5; *b*, stem leaf, × 3; *ls*, lamellæ in cross section, × 200; *z*, apex of stem leaf, × 40.

508. *Pogonatum microstomum* (R. Br.) Brid. *b*, Stem leaf, × 4; *ls*, lamellæ in cross section, × 200; *z*, apex of stem leaf, × 40.

509. *Pogonatum Wallisi* (C. M.) Jaeg. *a*, Plant, dry, × 1; *b*, stem leaf, × 40; *ls*, lamellæ in cross section, × 200; *z*, apex of stem leaf, × 40.

510. *Dawsonia superba* Grev. *a*, Plant, × 0.5; *b*, stem leaf, × 1; *l*, lamellæ, × 200.

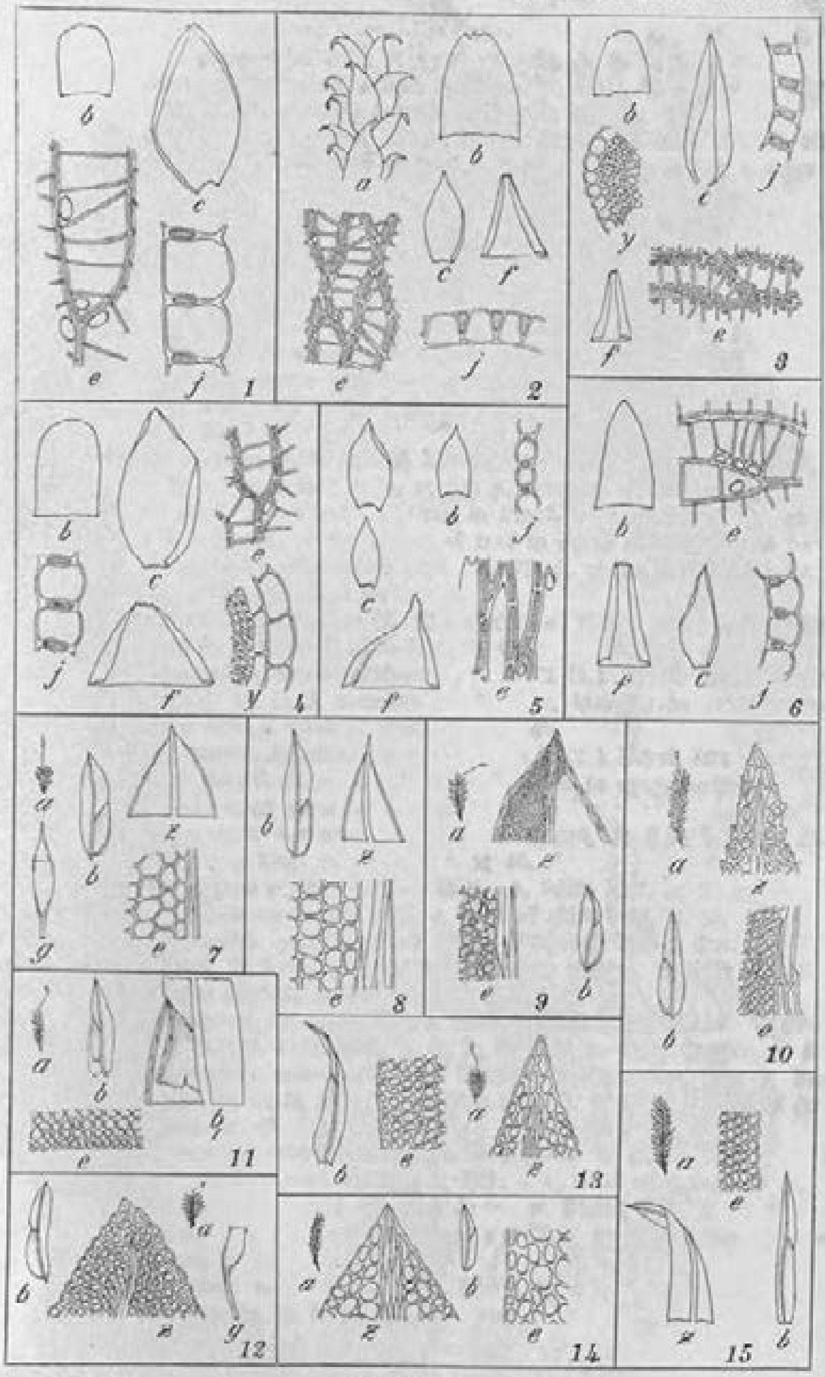
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PLATE 1.

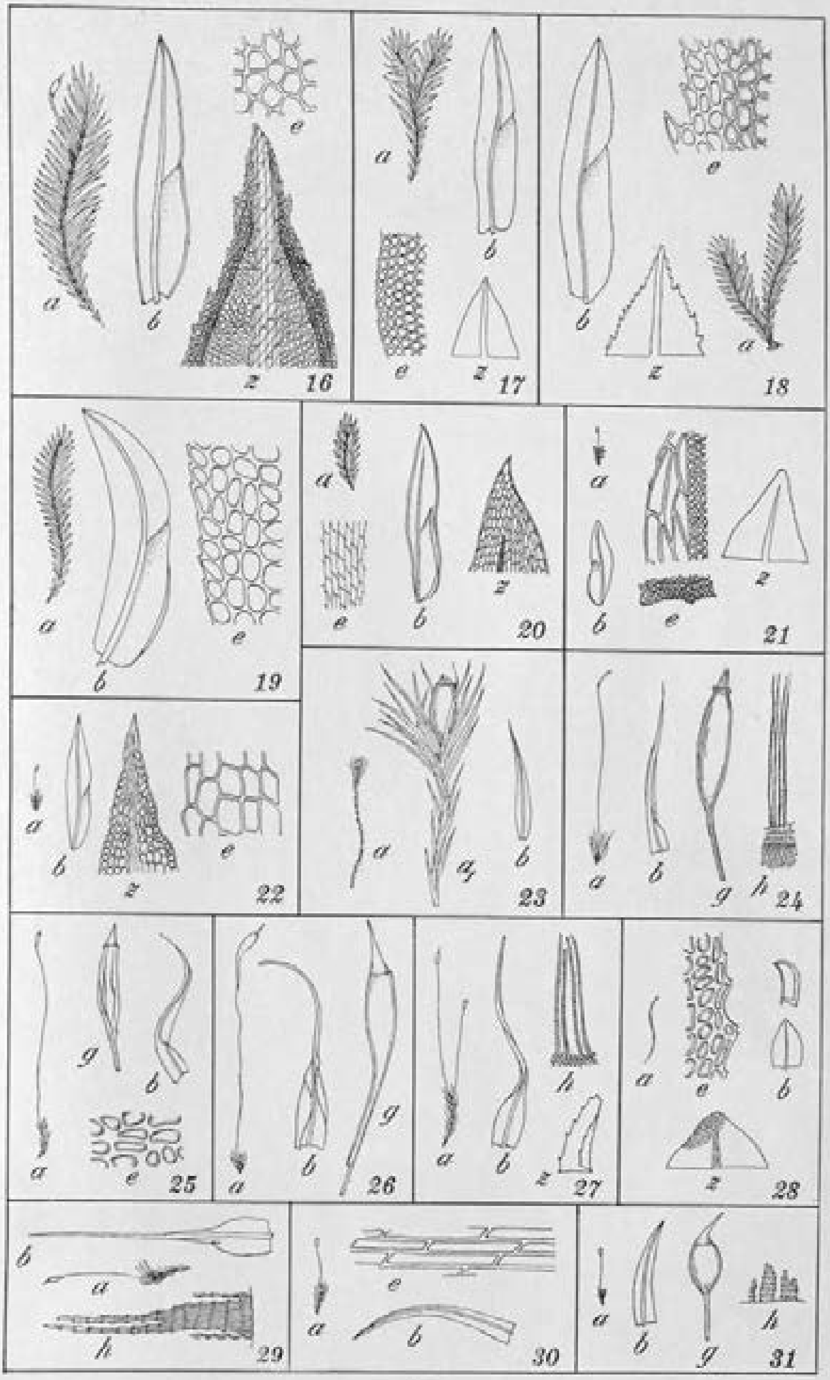
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PLATE 2.

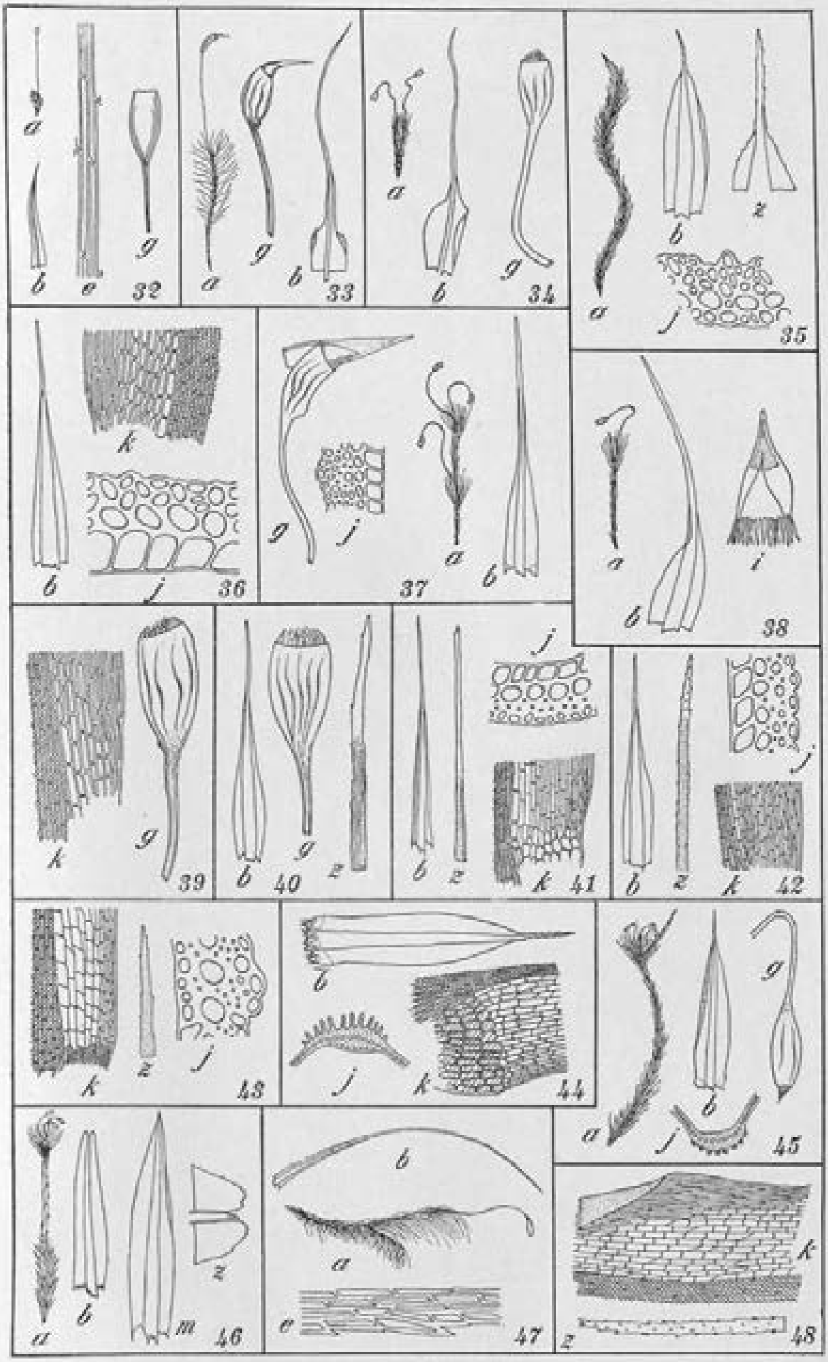
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PLATE 3.

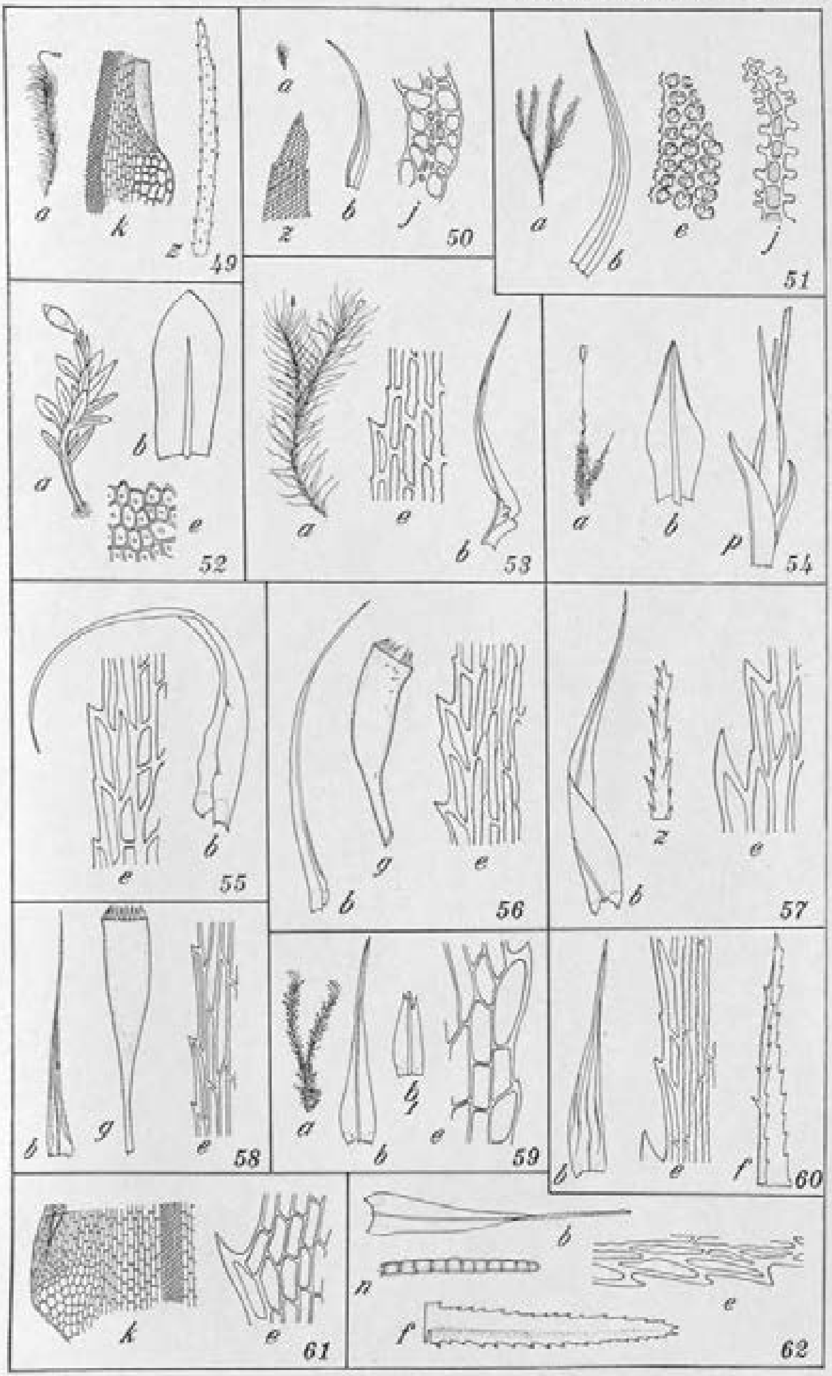
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PLATE 4.

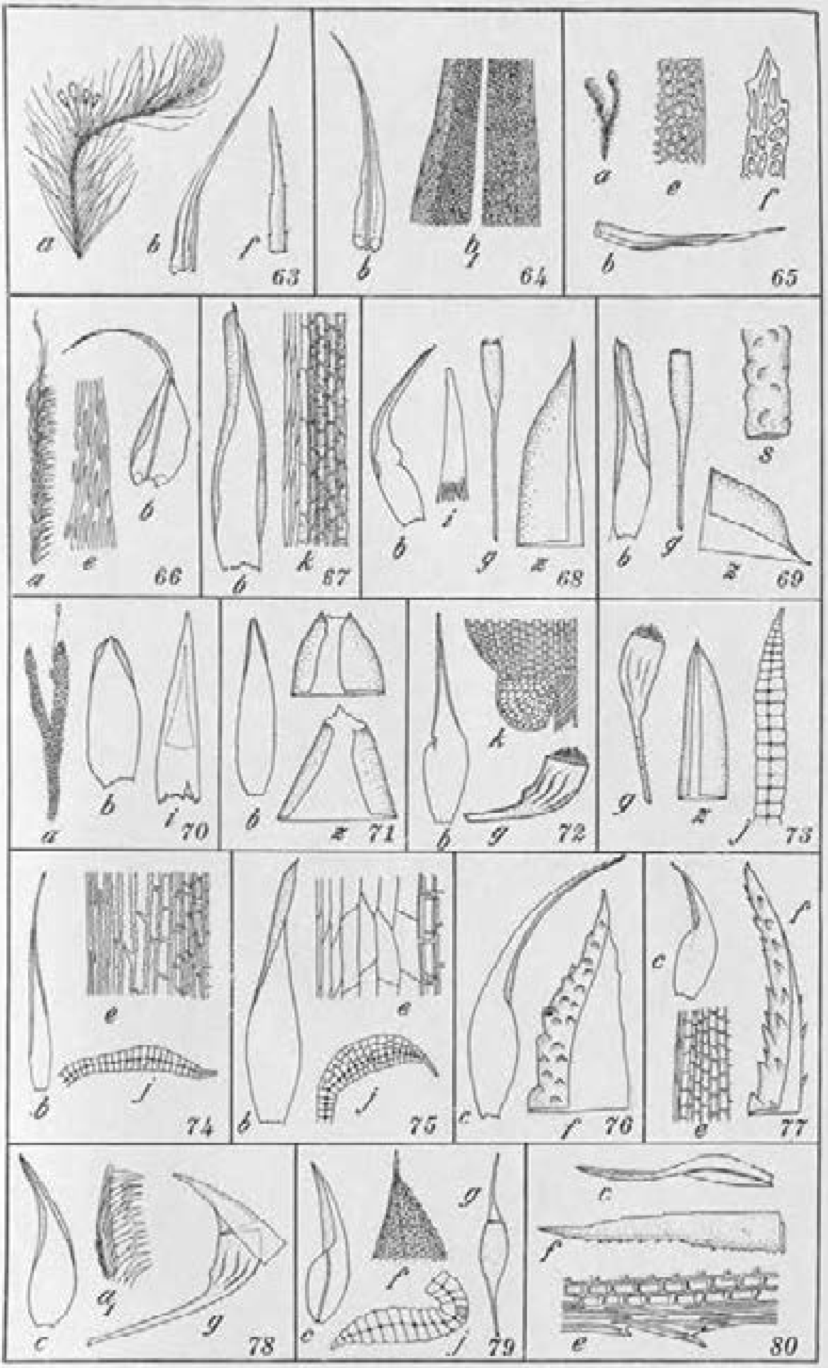
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PLATE 5.

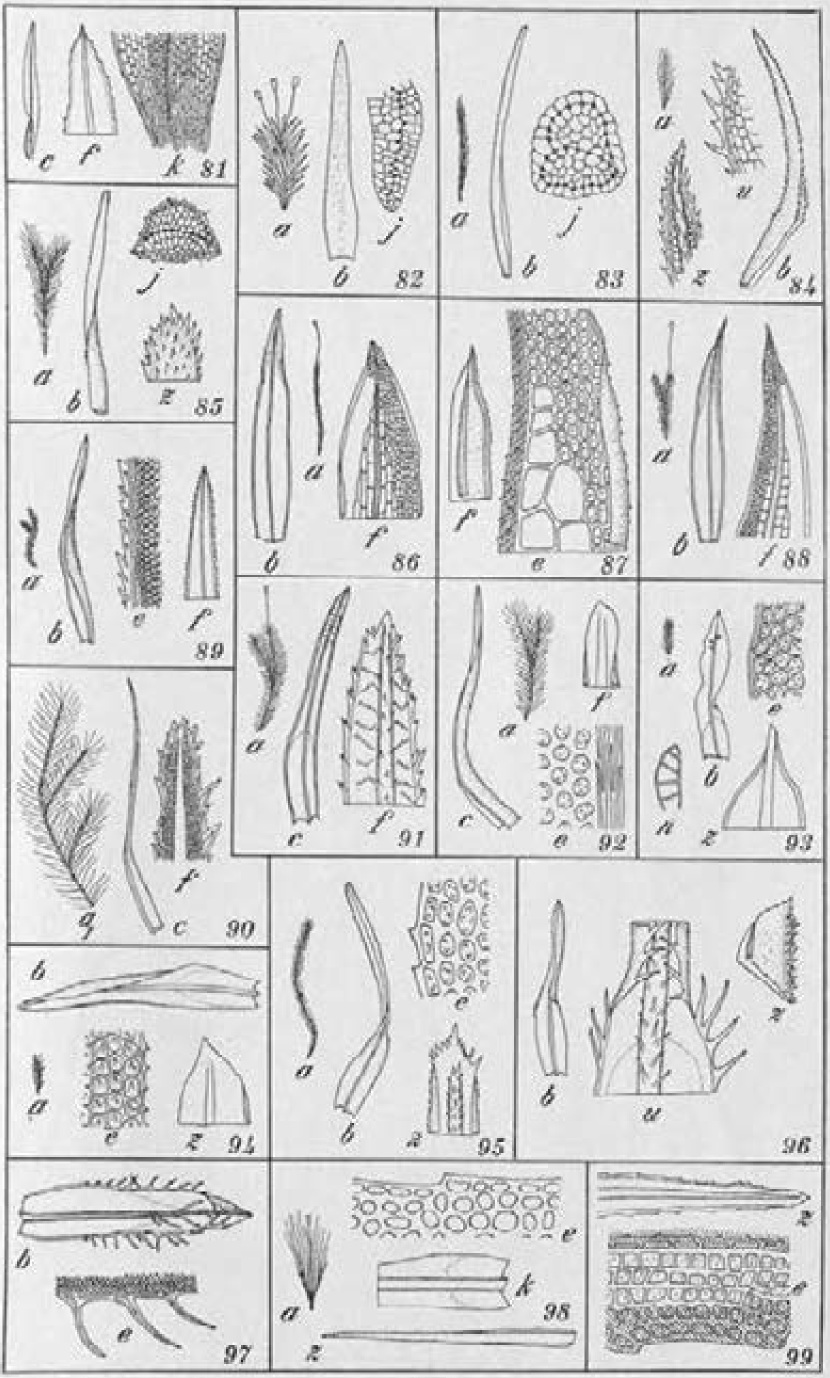
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PLATE 6.

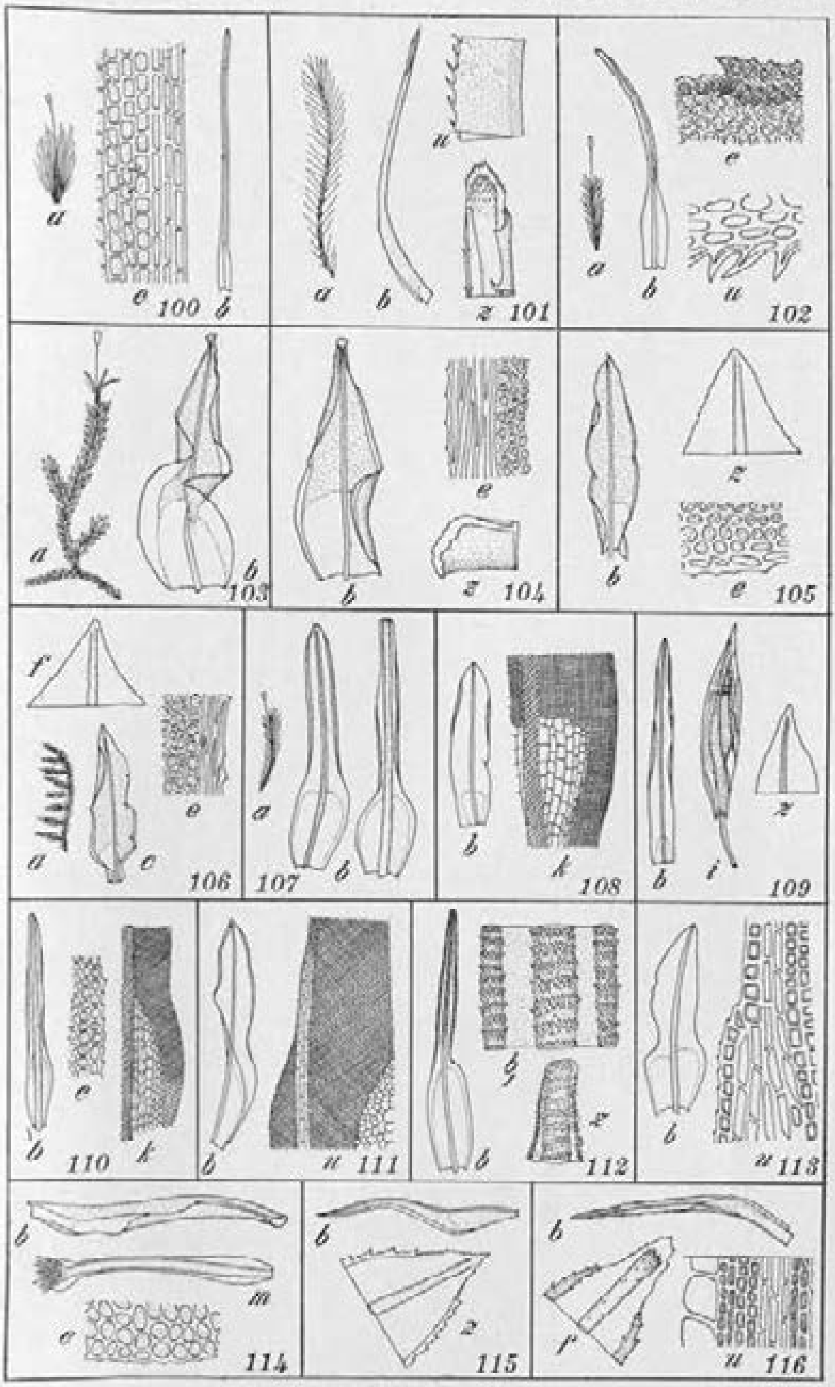
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PLATE 7.

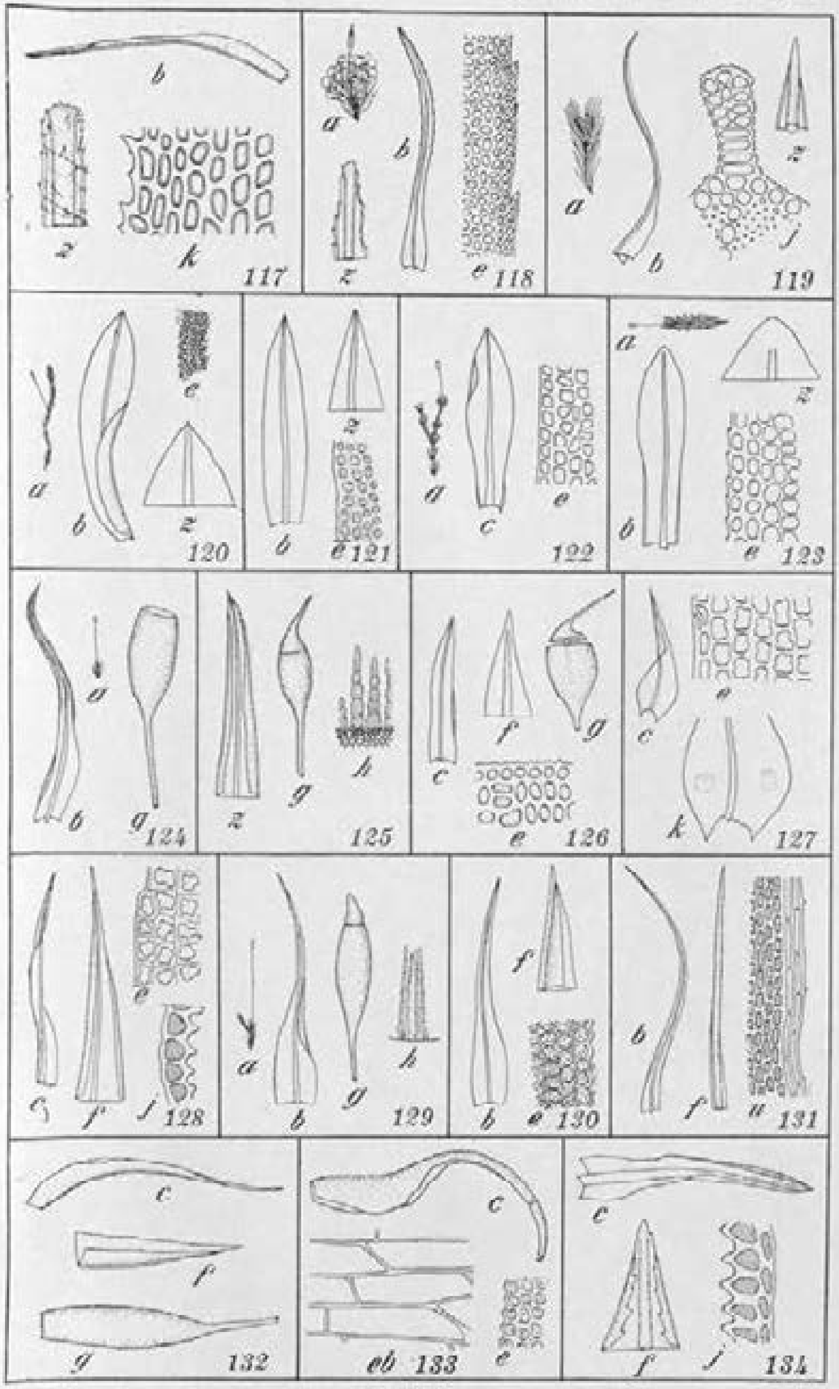
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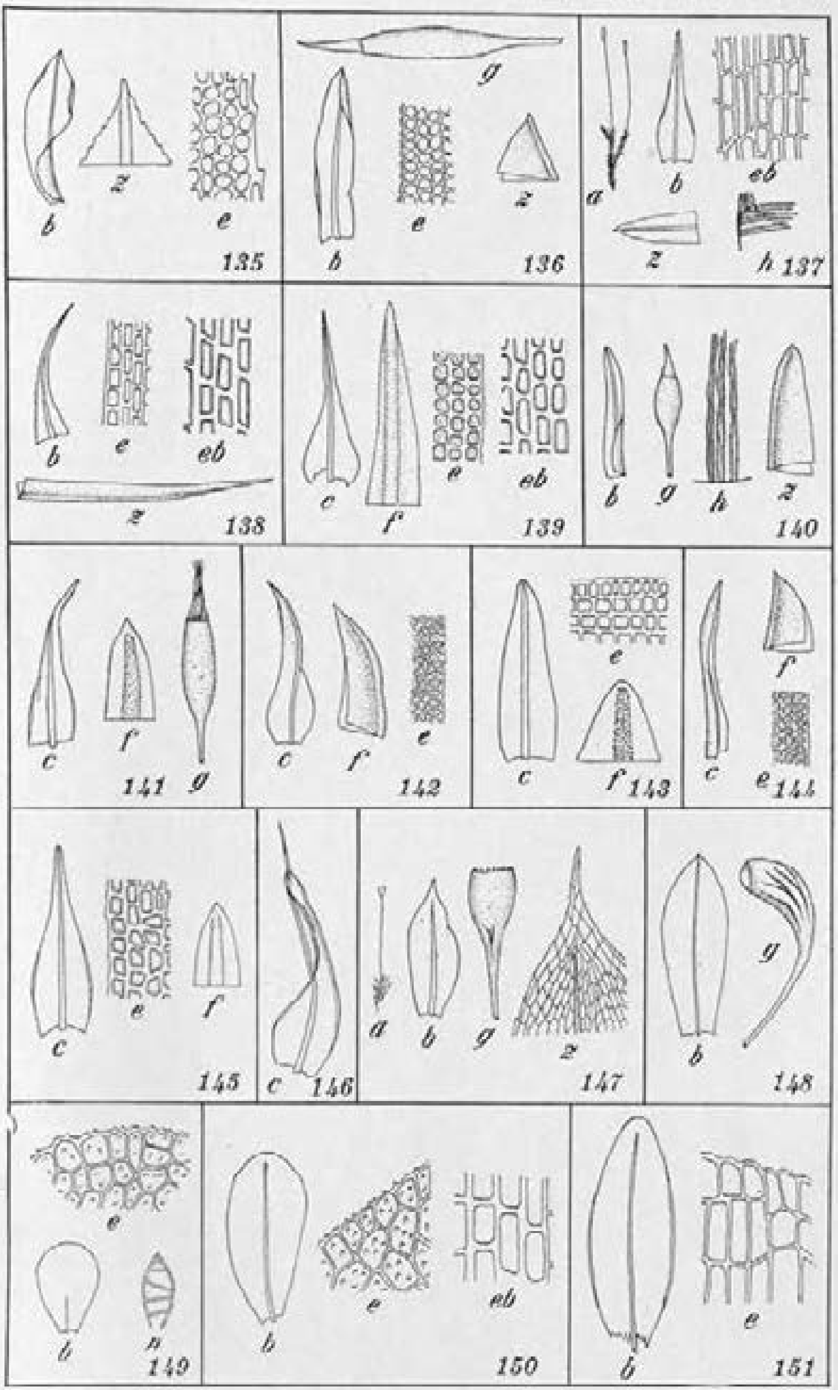
PLATE 8.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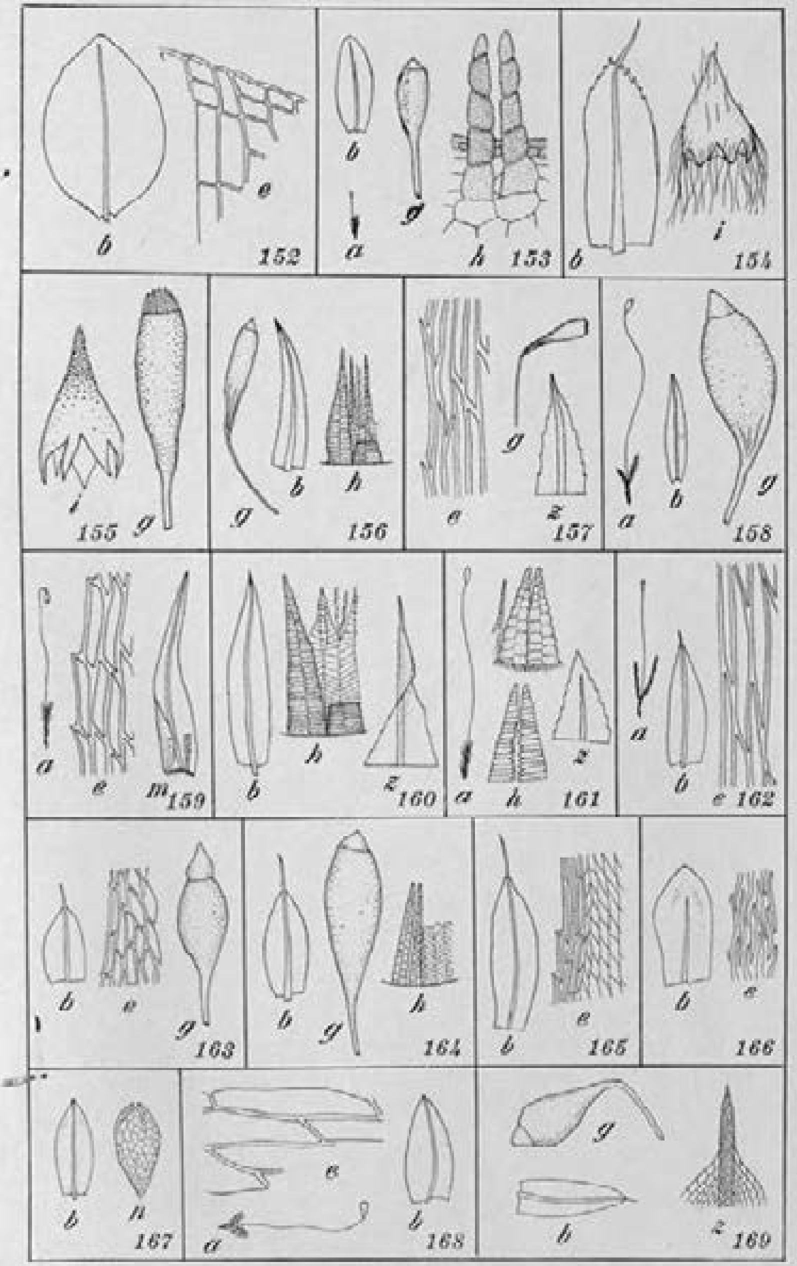
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PLATE 10.

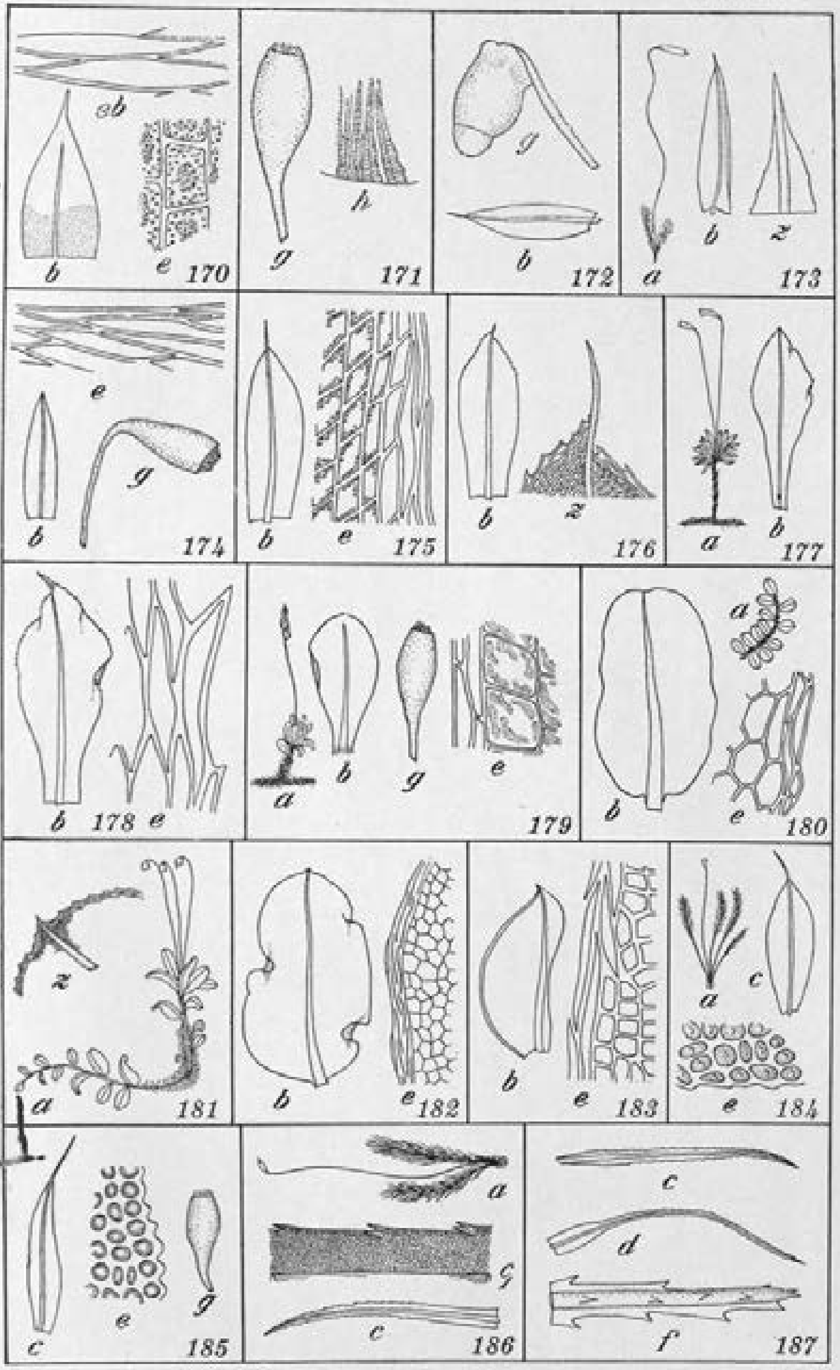
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PLATE 11.

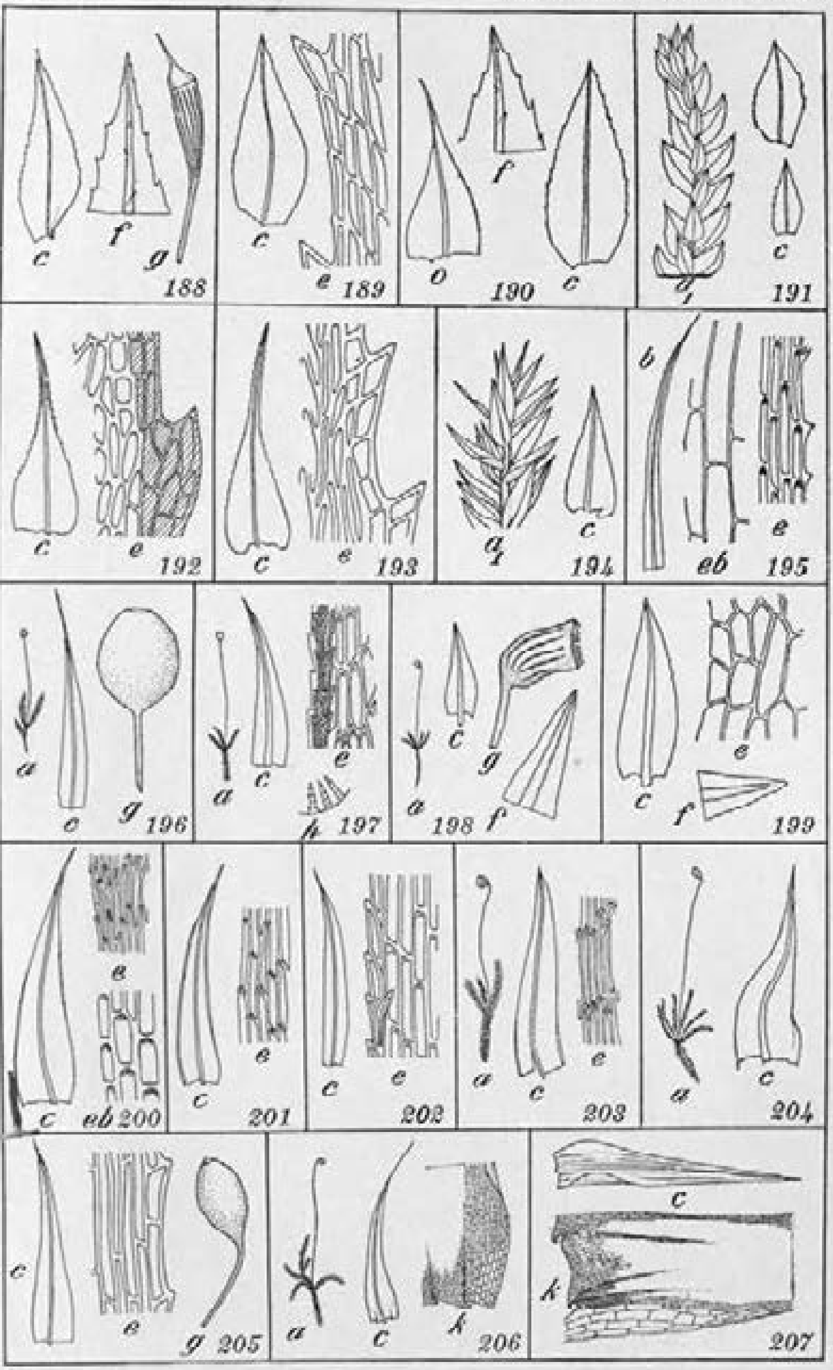
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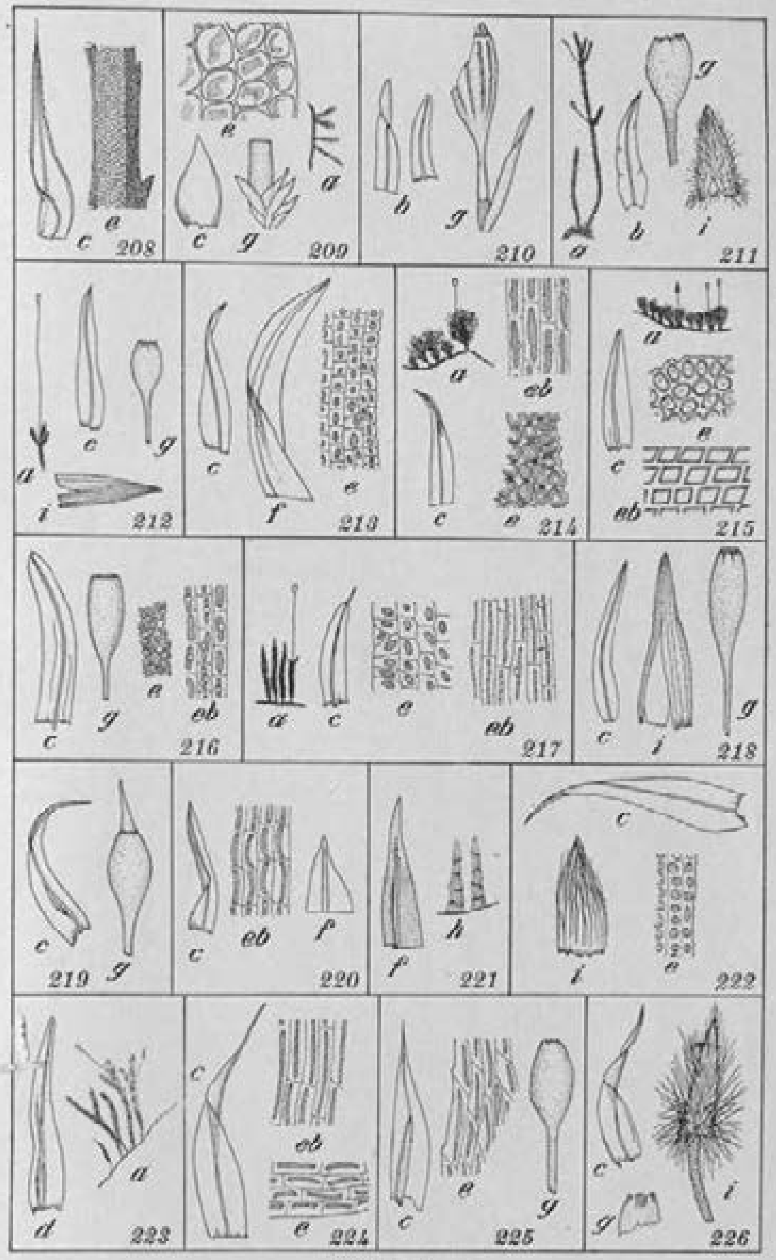
PLATE 12.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209
h
g
210
g
b
i
a
211
c
g
a
i
212
c
f
e
213
a
eb
c
e
214
a
e
c
eb
215
c
g
e
eb
216
a
c
e
eb
217
c
i
g
218
c
g
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f
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f
h
221
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c
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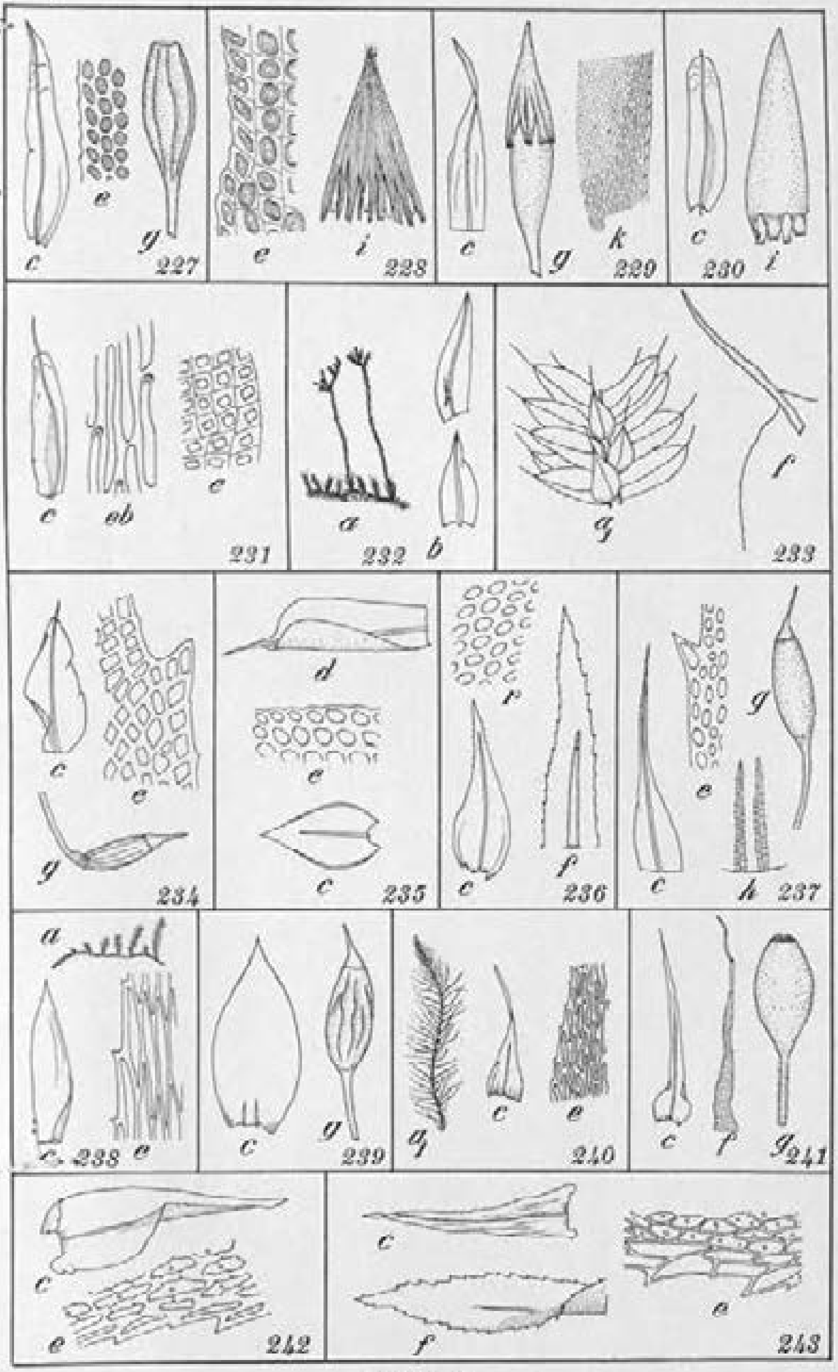
225
c
g
i
226

PLATE 13.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d
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c
235
r
c
f
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c
e
g
h
237
a
c
238
e
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g
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q
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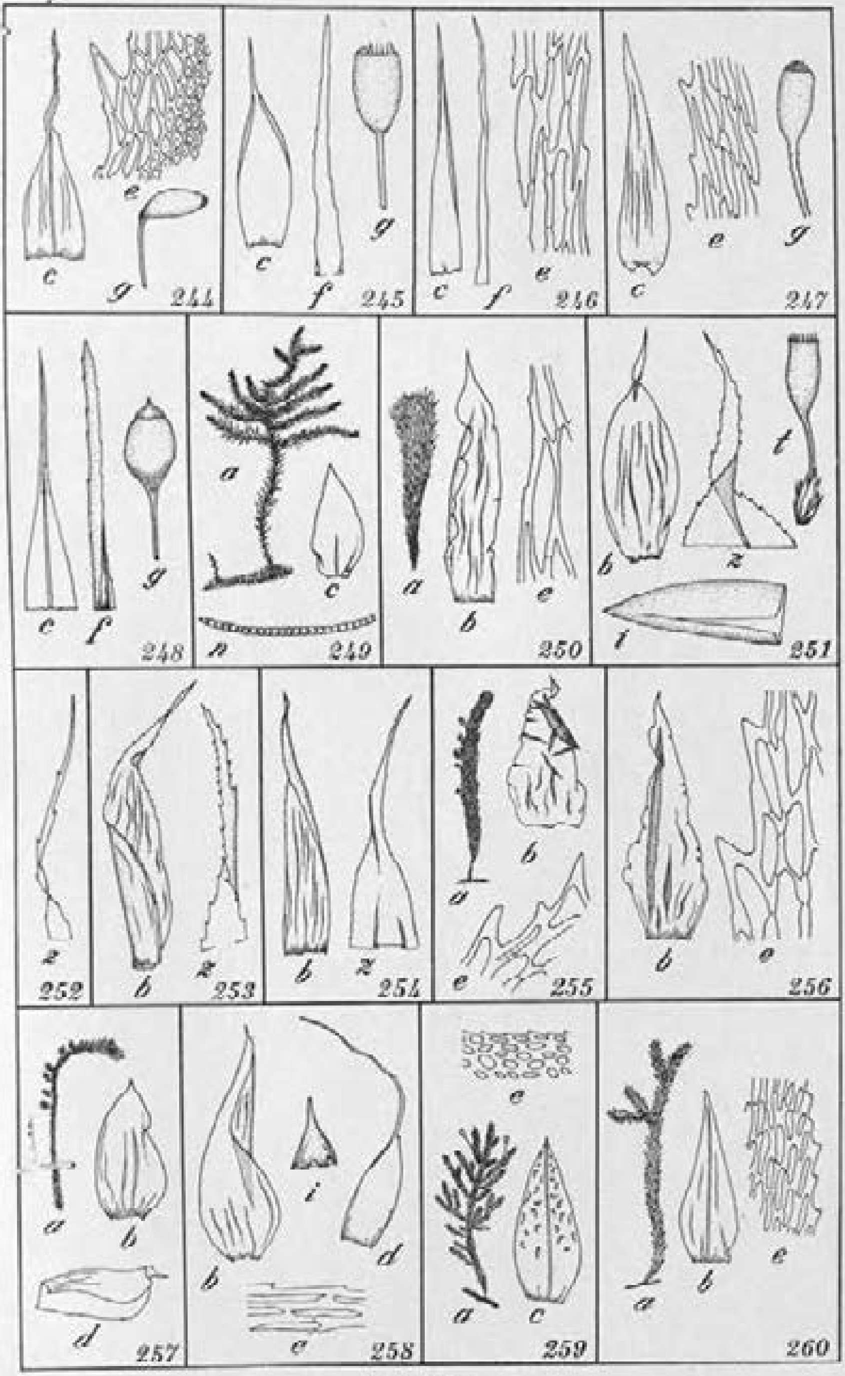
e
240
c
f
g
241
c
e
242
c
f
e
243

PLATE 14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b
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l
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z
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b
z
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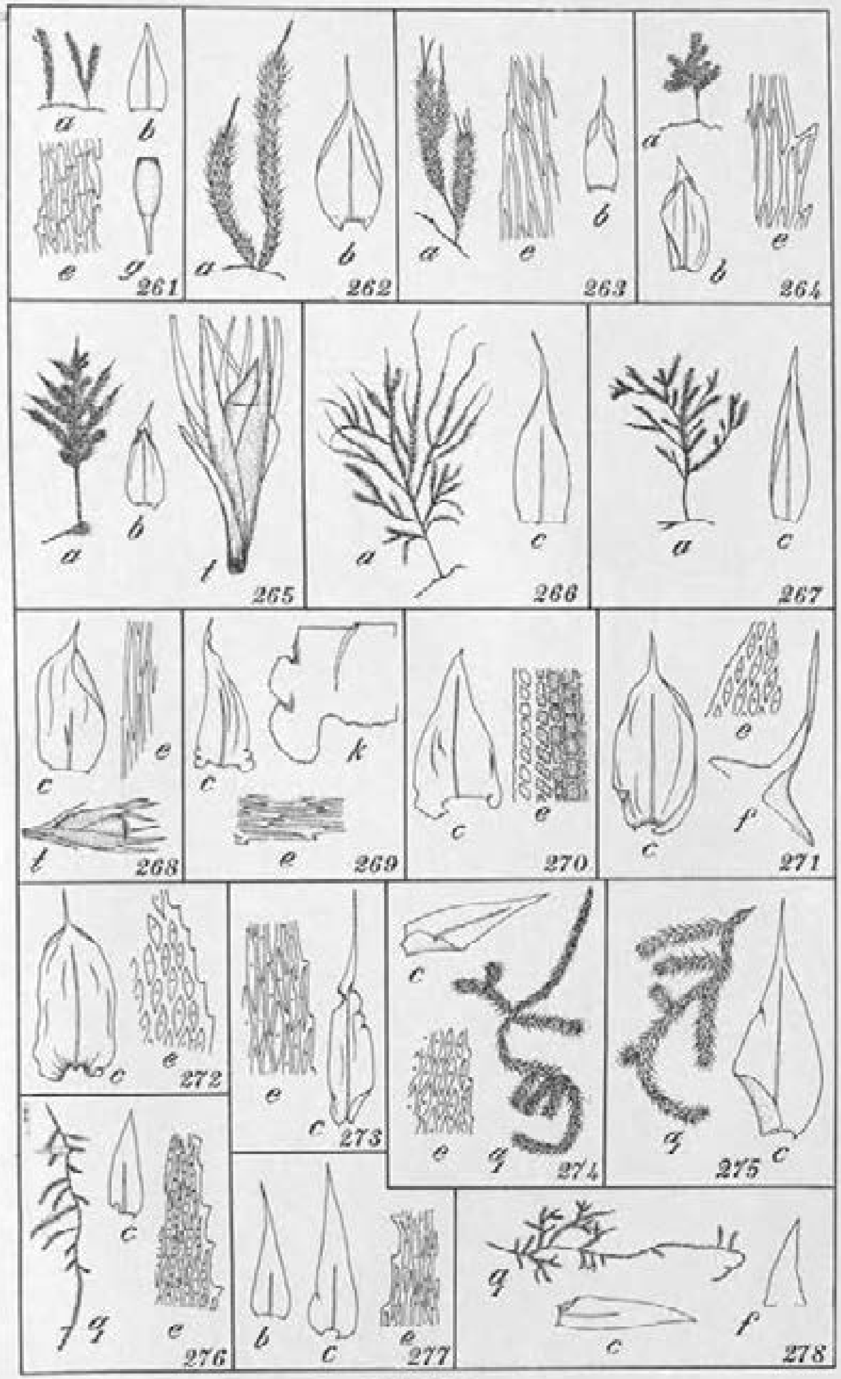
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b
264
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b
l
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c
266
a
c
267
c
e
l
268
c
k
e
269
c
e
270
e
c
f
271
c
e
272
e
c
273
c
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q
c
f
278

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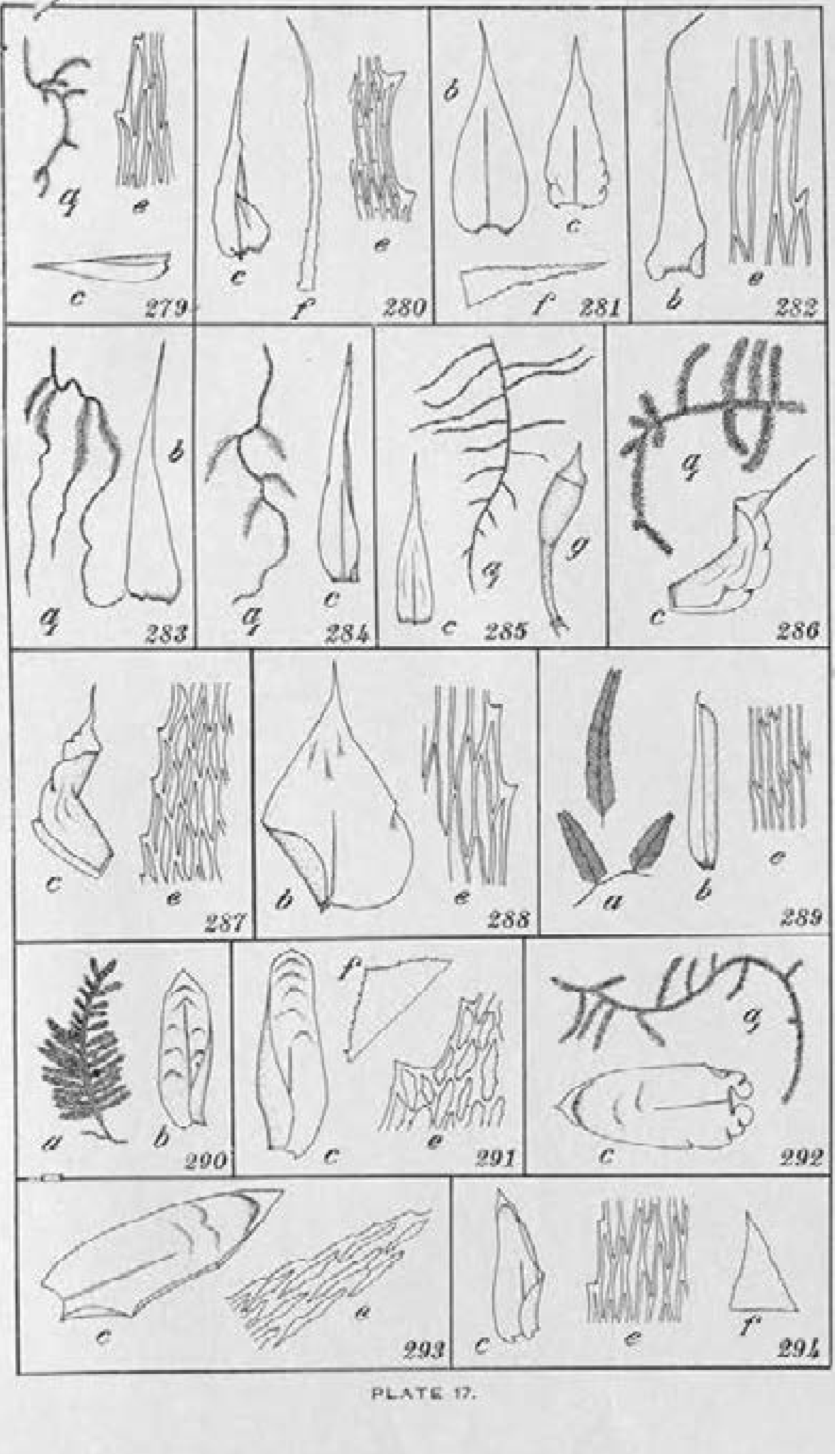
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b
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f
294

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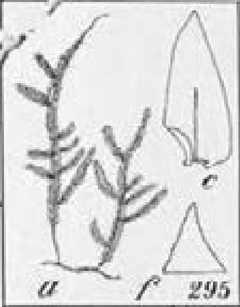

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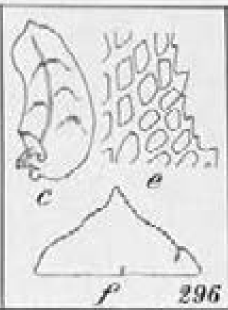

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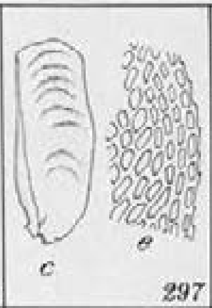

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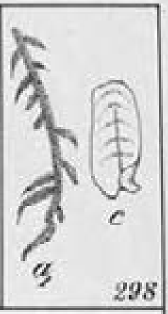

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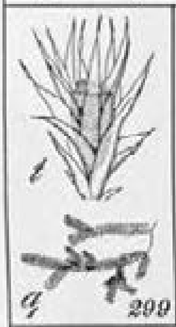

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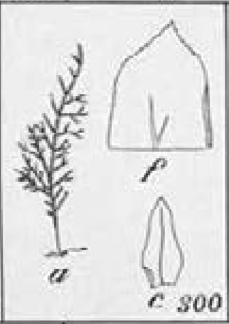

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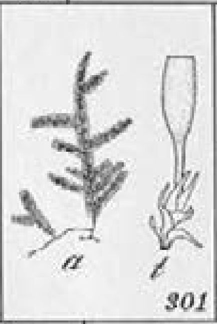

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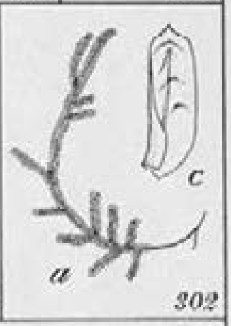

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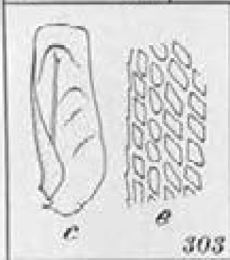

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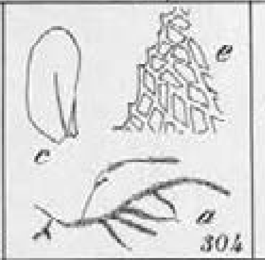

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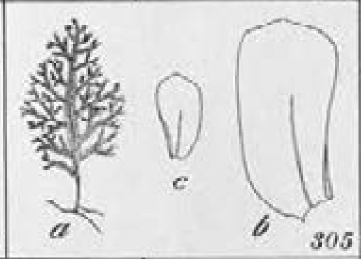

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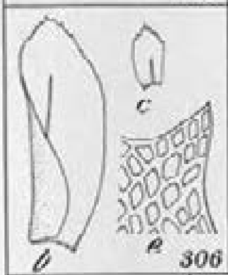

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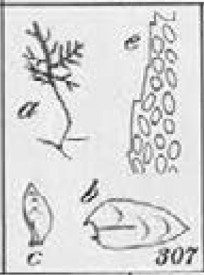

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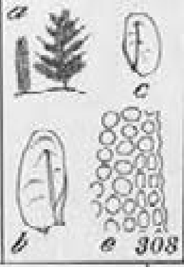

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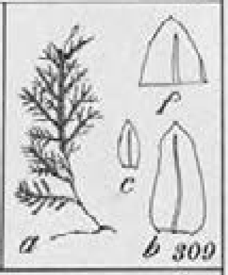

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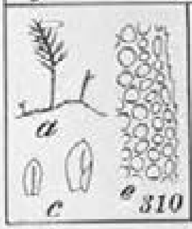

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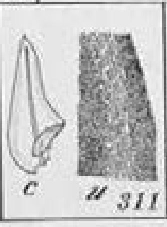

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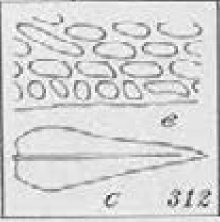

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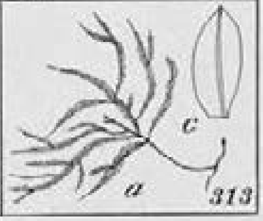

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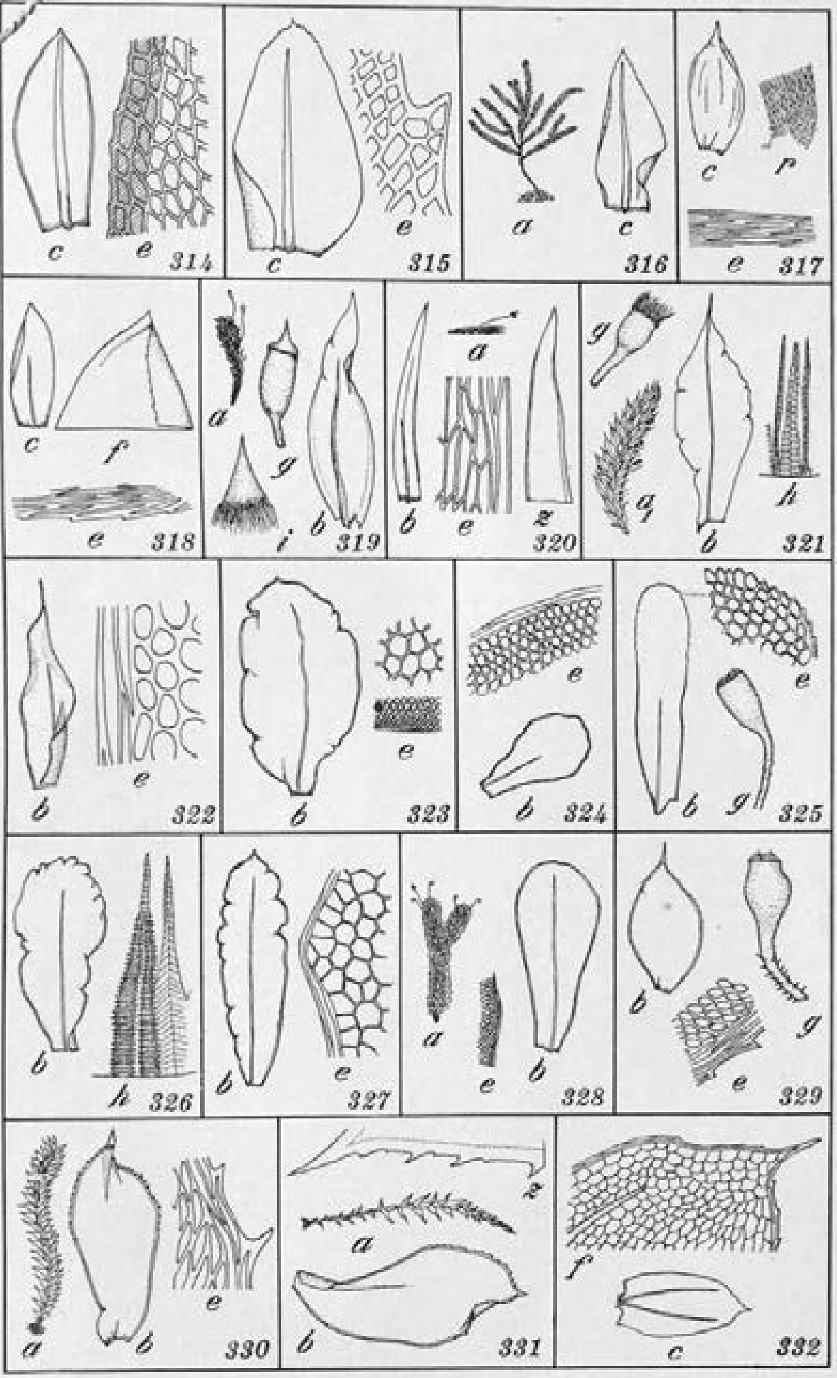
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e
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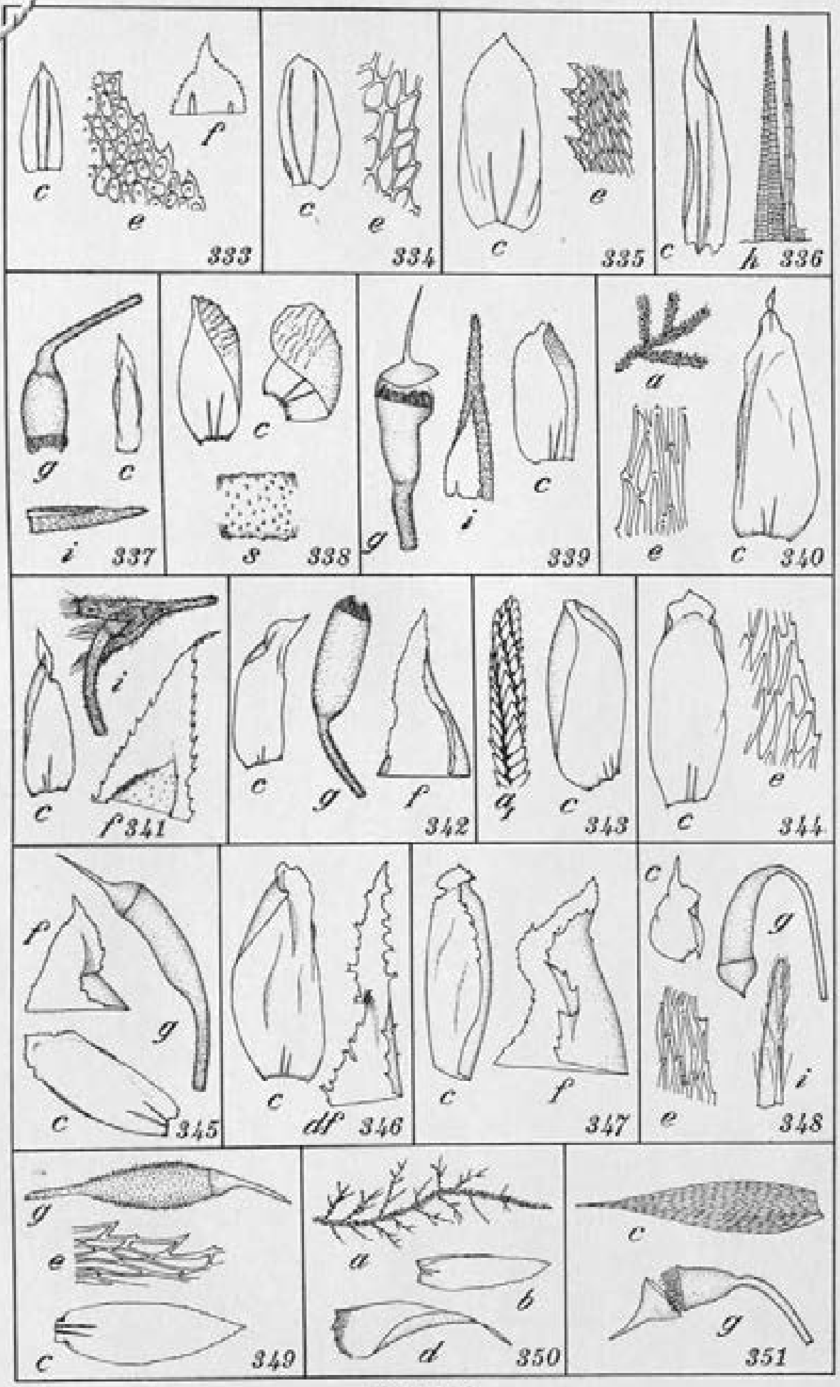
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c
e
344
f
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c
345
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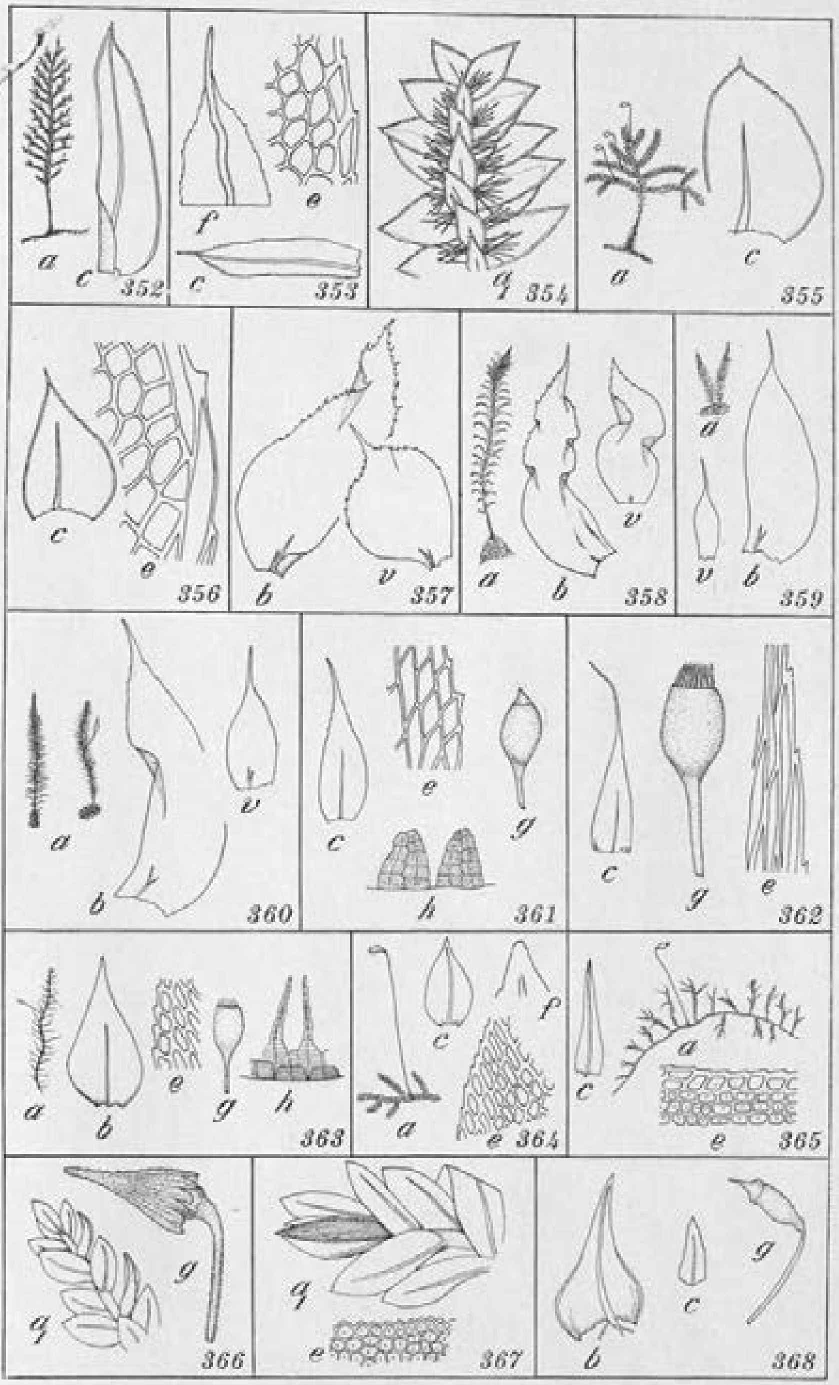
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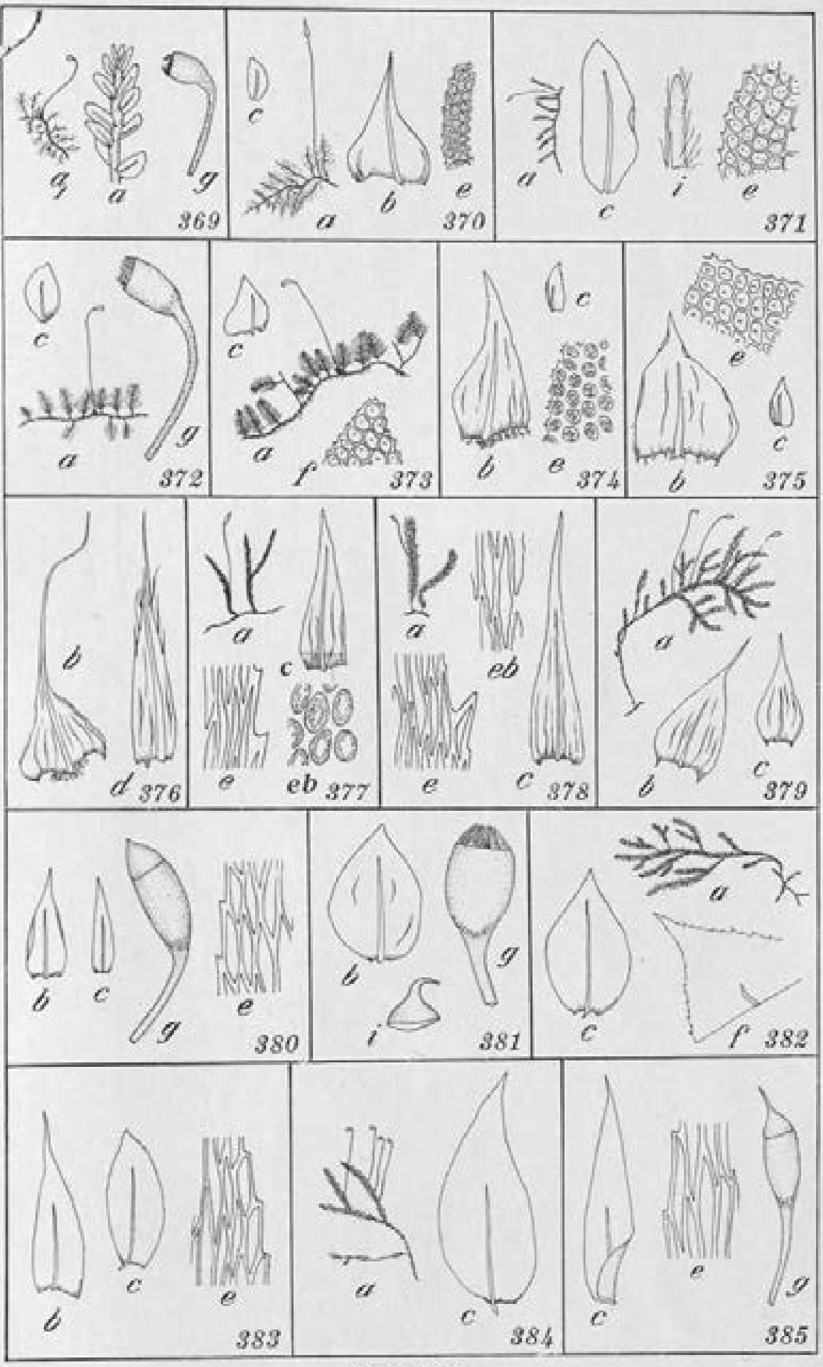
368

PLATE 21.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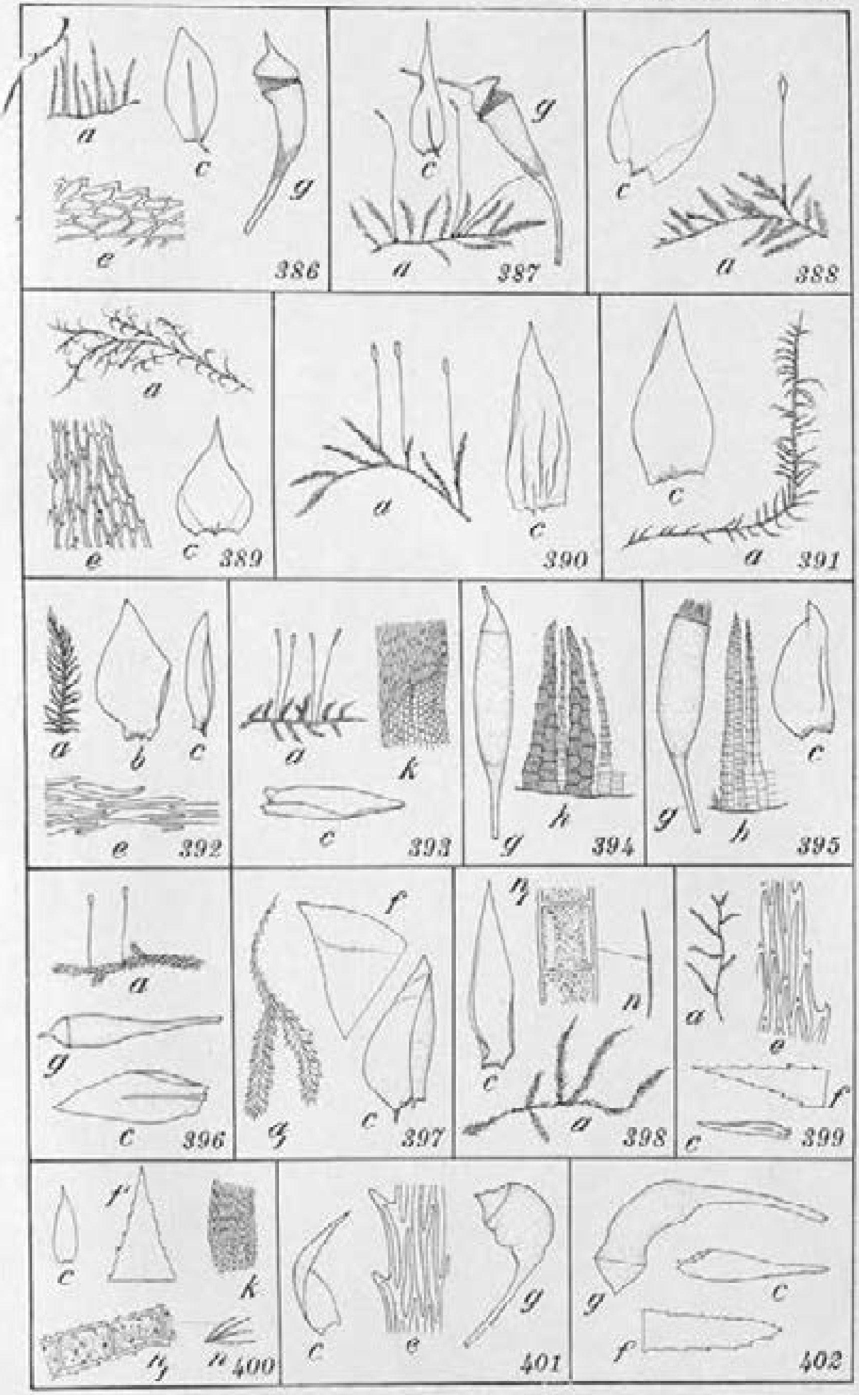
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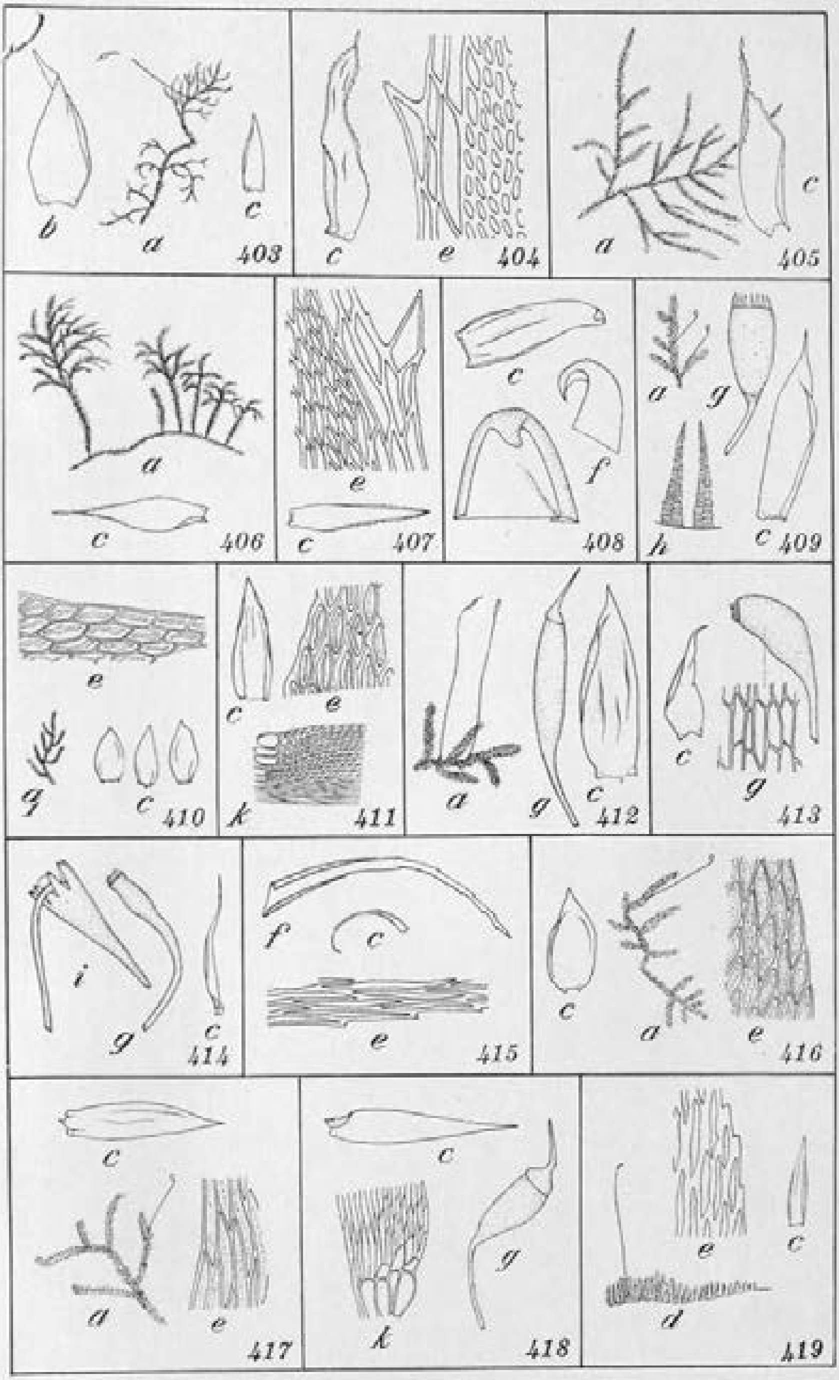
PLATE 21.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d
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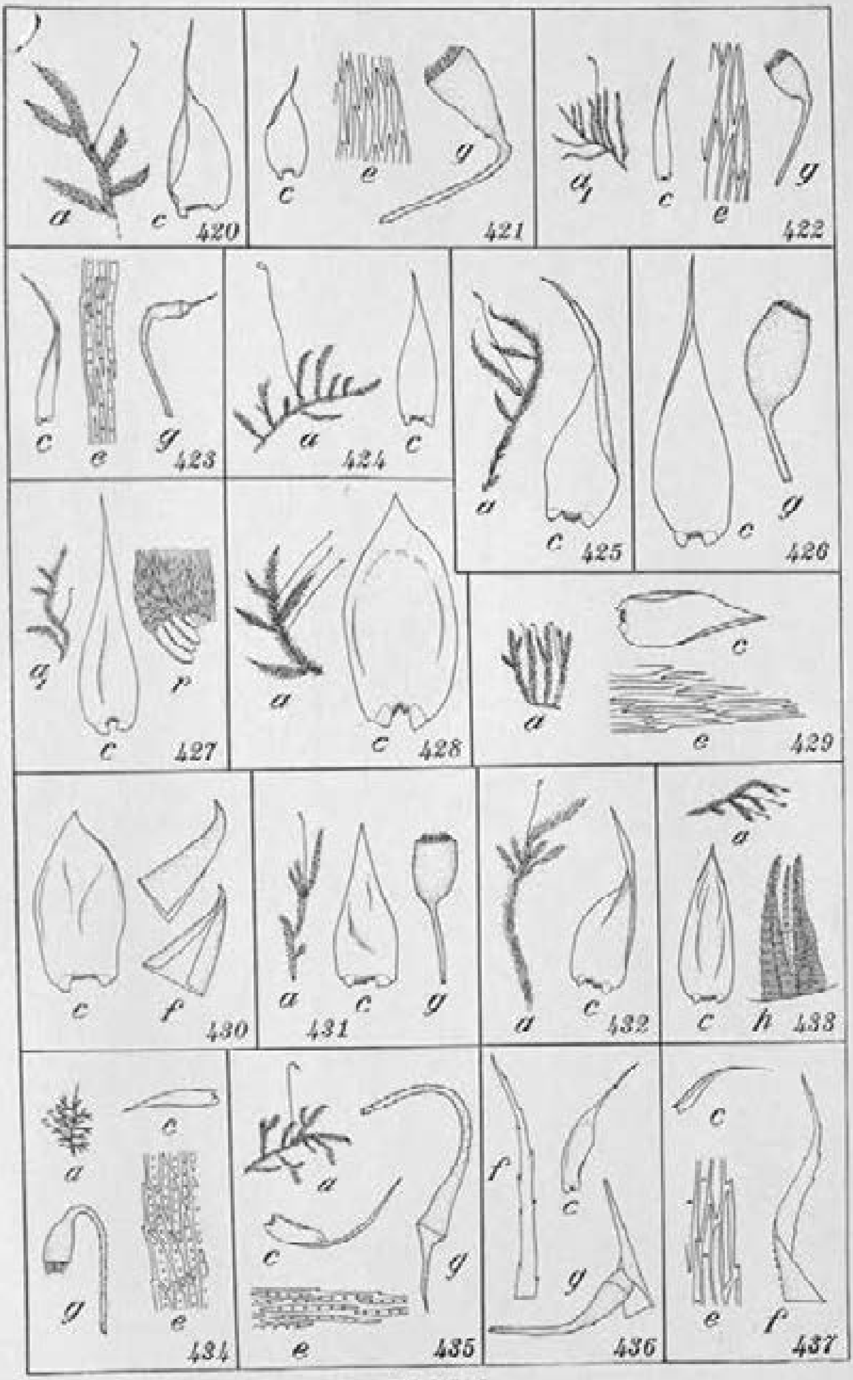
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a
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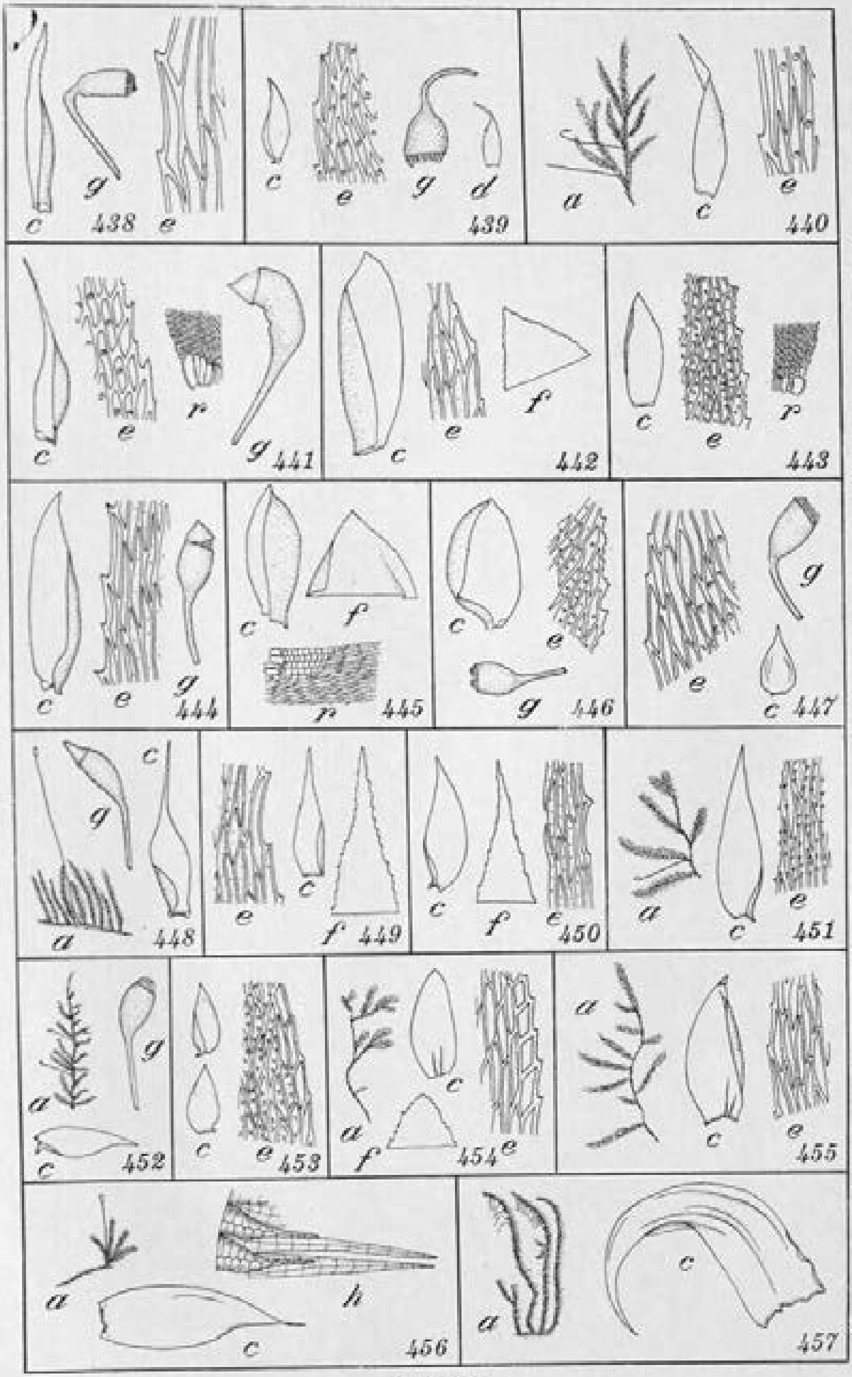
437

PLATE 25.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a g c 448
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a g c 452
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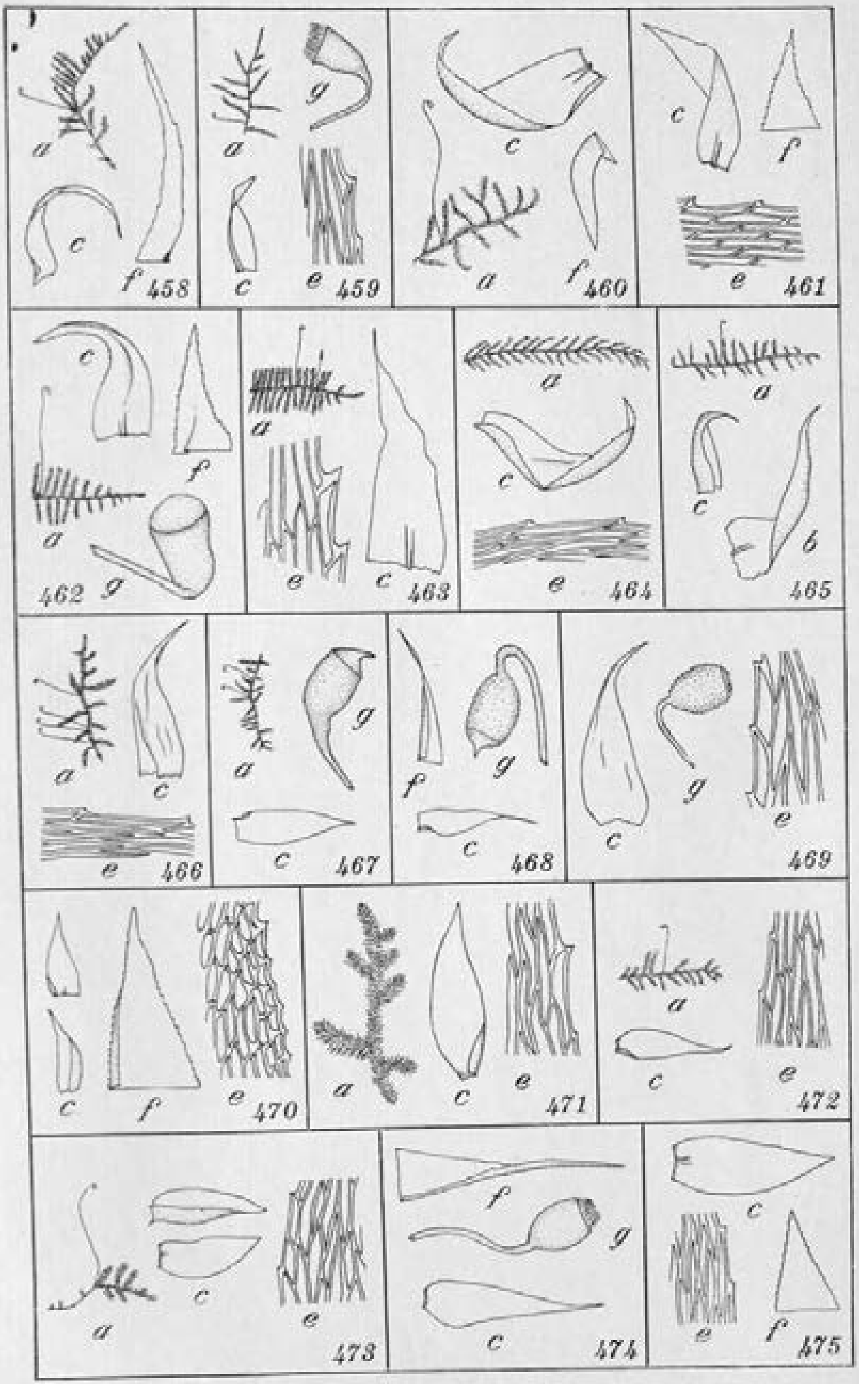
a c 457

PLATE 29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b
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f
g
c 468
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f 475

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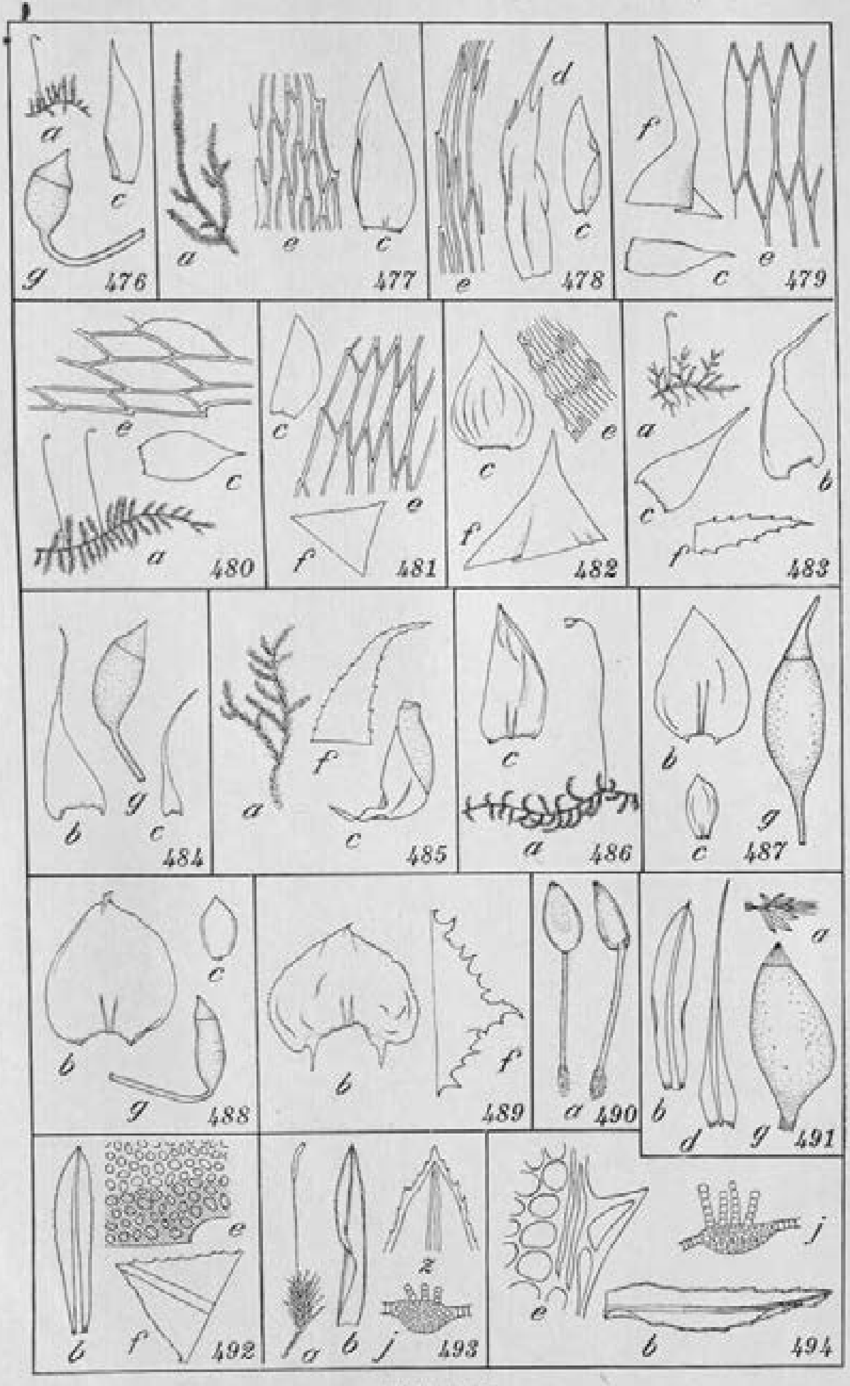
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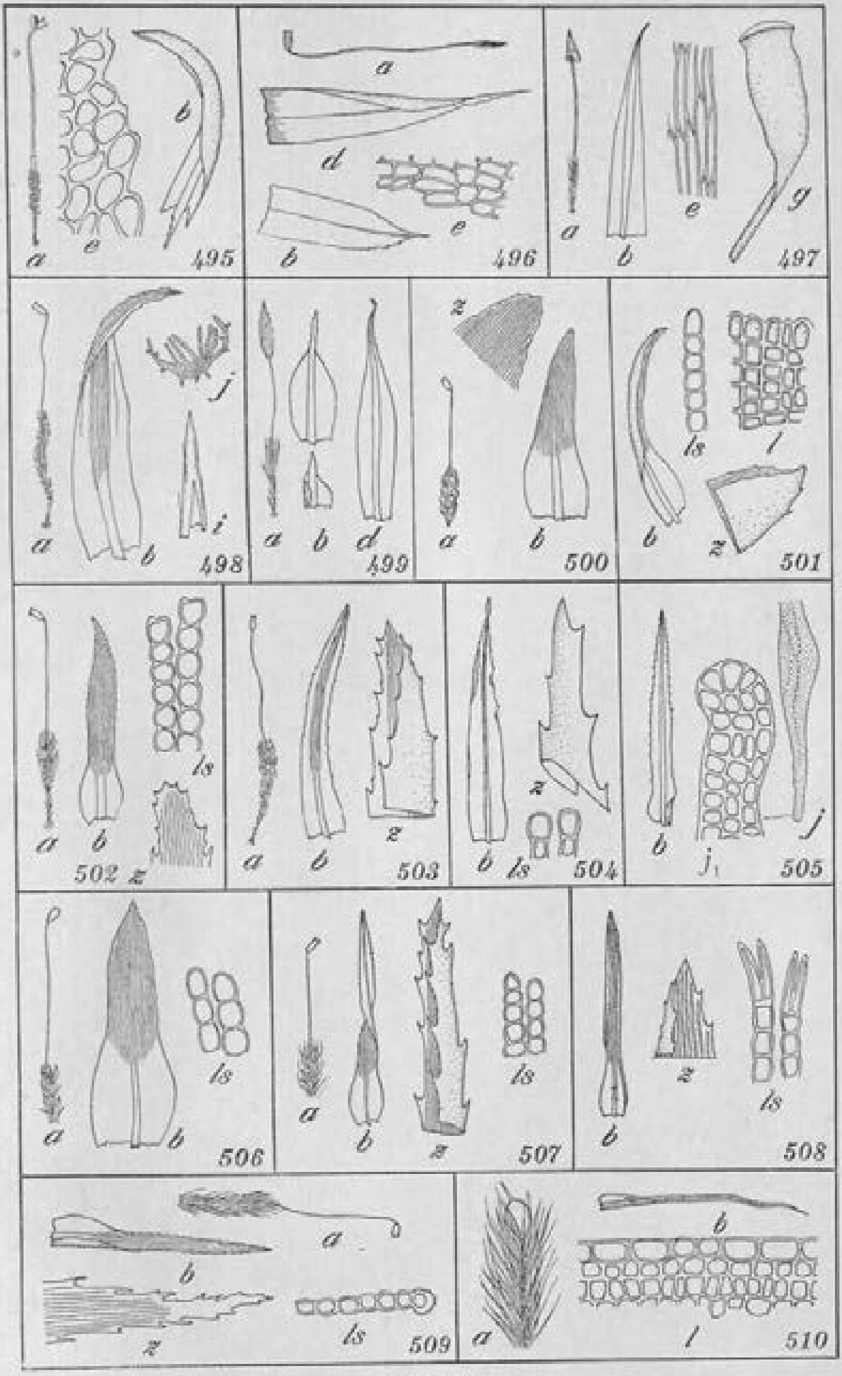
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ls
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j₁
j
505
a
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ls
506
a
b
z
ls
507
b
z
ls
508
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b
z
ls
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a
b
l
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